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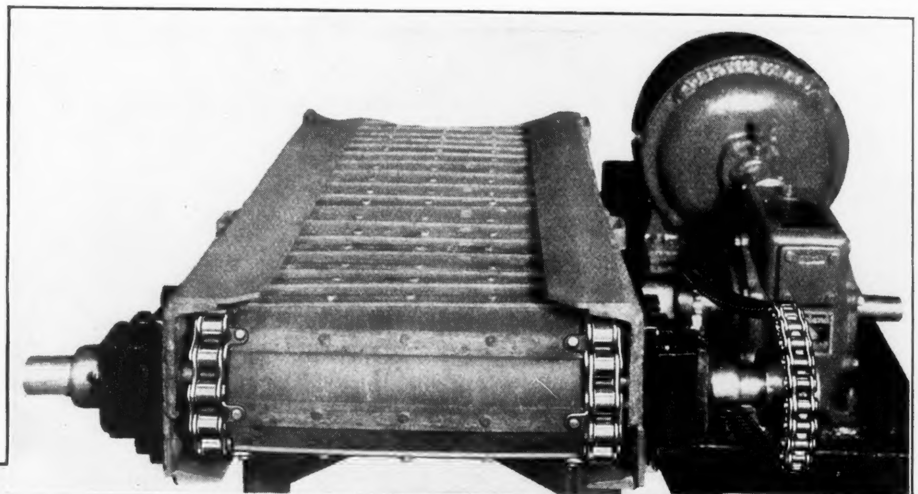

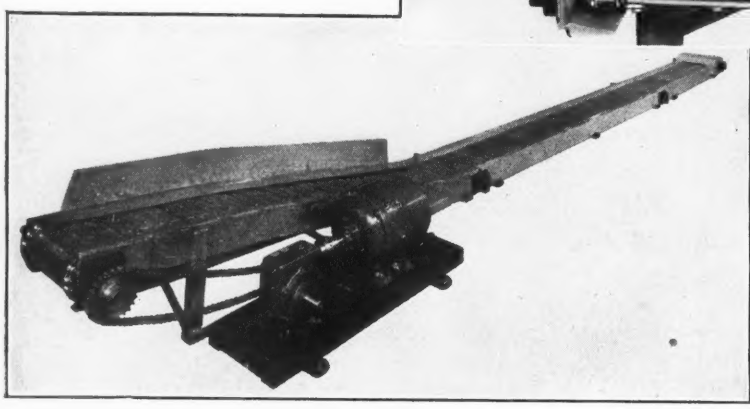

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MACHINERY

Volume 39 NEW YORK, JANUARY, 1933 Number 5

109° Below Zero

An Ideal Temperature for Certain Metal-Working Operations

By CHARLES O. HERB

A REMARKABLE achievement in the field of chemistry attracted popular attention several years ago when it was announced that a substance known as "dry ice" had become available, which made it possible to pack ice cream so that it could be carried home in an ordinary package without becoming melted, and served several hours later. This mysterious substance naturally appealed to the imagination and made people want to know more about it. The temperature of dry ice (109.6 degrees F. below zero) is too low to be comprehended, for the lowest recorded atmospheric temperature is 95 degrees F. below zero. As a matter of fact, the lowest average temperature for January at the North Pole has been estimated to be only 42 degrees F. below zero.

The value of dry ice as a refrigerant for foodstuffs during transportation and storage is now fairly well known. This was the purpose for which chemists had long sought a method of making dry ice (solid carbon dioxide) on a commercial basis. But at the time dry ice was developed, no one thought of the possibility of utilizing it in the metal-working industry, and yet it is actually being used in this field today. Because of its extreme coldness, dry ice is being employed for contracting metal parts to facilitate their assembly into other pieces; for keeping aluminum-alloy rivets in an annealed state until used; and for appreciably hardening certain steels by cooling them to abnormally low temperatures.

Fire-fighting apparatus built by the American-LaFrance &

Fig. 1. Cast-iron Liners, Contracted by the Intense Cold of Dry Ice, Slide Easily into the Cylinder Bores and Expand to a Tight Fit

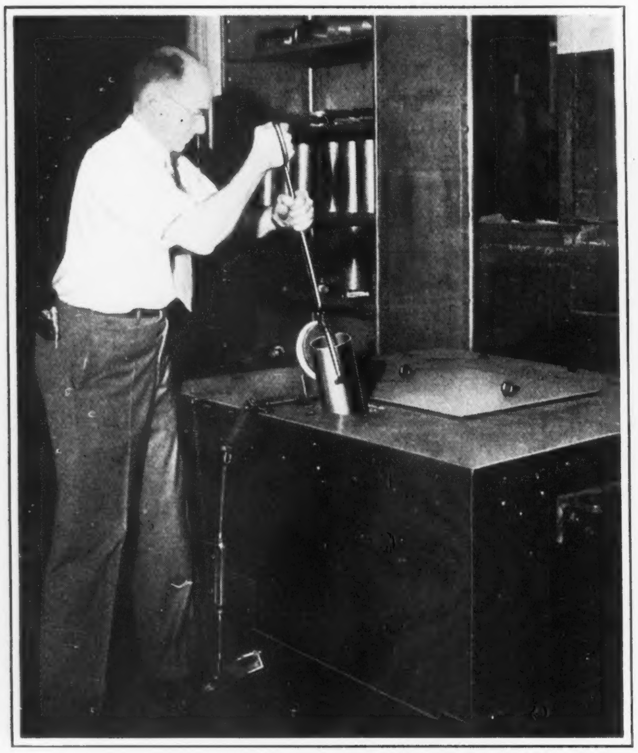


Fig. 2. In this Refrigerator of Dry Ice, the Cylinder Liners Contract Approximately 0.006 Inch in Sixteen Minutes

Foamite Corporation, Elmira, N. Y., is equipped with twelve- and sixteen-cylinder engines of the 30-degree V-type. The cylinder bores of the engine blocks are fitted with cast-iron sleeves or liners in which the pistons reciprocate. This construction permits of reconditioning the engines conveniently as the cylinders become worn in service by substituting new liners. The liners are of the same analysis as the engine blocks, and, therefore, have the same rate of expansion and contraction when subjected to heat and cold.

Dry Ice Aids in Assembling Cylinder Liners

The assembly of these cylinder liners into the bores of the engine blocks is an operation of considerable importance, because the fit must be such that the liners will be held immovable in service. This is where dry ice proves of value. The liners are first ground on their outside cylindrical surface and selected to provide an expansion fit up to 0.0015 inch in the reamed bores of the cylinder blocks. The liners are placed for sixteen minutes in a refrigerator of dry ice, prior to the assembly. During this period, they shrink about 0.006 inch in diameter. They can then be slipped quickly into the cylinder bores. Almost instantly, the liners exert a heavy pressure on the bore walls as they expand to their normal diameter at room temperature. In tests conducted under a press, from 3000 to 5000 pounds of pressure was necessary to force one of these liners from its bore.

A general view of the dry-ice refrigerator in which the cylinder liners are contracted is shown in Fig. 2, while details of the refrigerator are shown in the sectional drawings, Fig. 3. Four cubes of dry ice, each measuring 10 by 10 by 10 inches and weighing 50 pounds when received from the Dry-Ice Corporation, are placed in the center of the refrigerator, as indicated. These cubes last about three days. They maintain the temperature of the box at 105 degrees F. below zero. The box is, of course, well insulated to prevent the dry ice from absorbing the atmospheric heat. Space *F*, for instance, which extends all around and below the dry ice compartment, is packed with "Dry Zero"—kapok in blanket form. Cork can also be used for this purpose.

Sixteen aluminum containers *A*, spaced around the dry-ice compartment, receive the cylinder liners and prevent them from coming in direct contact with the dry ice. These containers are mounted on a circular table which is indexed through a ratchet mechanism, operated by handle *B* on the right-hand side. Each time this handle is moved, a different container is brought beneath opening *C* near the front of the refrigerator. This opening is normally sealed tight by spring-cover *D*. The cover is raised by means of a foot-treadle, as shown in Fig. 2, to permit a cold cylinder liner to be removed from the aluminum container or a new liner to be inserted in a container.

A Coating of Oil Prevents Hoar-Frost

Each cylinder liner is selected for the particular engine-block bore in which it is to be assembled. The liners are ground to size on the outside within a tolerance of 0.00025 inch, and the bores are reamed to specifications within a tolerance of 0.001 inch. Both the liner and the bore are stamped by inspectors to insure the correct allowance for the fit desired. At the bottom of each bore, a machined shoulder extends half way around to serve as a stop when the liner slides into place. Also, the top of each bore is relieved slightly for a distance of 1 1/2 inches to permit ready insertion of the liner. The nominal outside diameter of the liners is approximately 4 1/4 inches, the walls are 1/8 inch thick, and the liners are 9 7/8 inches long over all.

Before each liner is placed in the refrigerator, it is immersed in a pail of thin oil and becomes covered with a light film that protects it against hoar-frost, which would be produced by the intense cold to which the liner is subjected. The oil is a light dynamo oil cut 50 per cent with kerosene.

A Cylinder Liner is Assembled Every Minute

The exact procedure in assembling the liners is for the operator to index the refrigerator table, raise the hinged cover *D* by means of the foot-treadle, remove a liner that has been in the refriger-

ator the required length of time, turn around and slip the liner into a predetermined bore in the engine block, as shown in Fig. 1, turn back to lift another liner from the pail of oil, and finally drop this liner into the aluminum container from which the cold liner has just been removed. The refrigerator table is then indexed again to bring another cold liner beneath the hinged cover, and another liner is immersed in the pail of oil. Long tongs are used in handling the cold liners, in order to prevent the operator's fingers from being frozen.

Speed is essential in transferring the cold liners from the refrigerator to the engine blocks, because while the liners have been contracted approximately 0.006 inch, they expand about 0.002 inch, even during a quick transfer. This leaves about 0.003 inch of play—enough to allow the liners to slide easily into place in the bores. The sliding action is also assisted by the oil film on the liners.

The time consumed in removing a liner from the refrigerator, slipping it into the engine block, loading an oiled liner into the aluminum container just emptied, indexing the refrigerator table, and immersing another liner in the oil pail is just about one minute. This means that each liner remains in the refrigerator approximately sixteen minutes.

Low assembly costs and cleanliness are the important features of this method. The dry ice costs the concern only about $2 a day, and, of course, only a small investment is tied up in the refrigerator. The dry-ice cubes come to the plant in insulated boxes and are placed in the refrigerator after the heavy lid *E*, Fig. 3, has been removed.

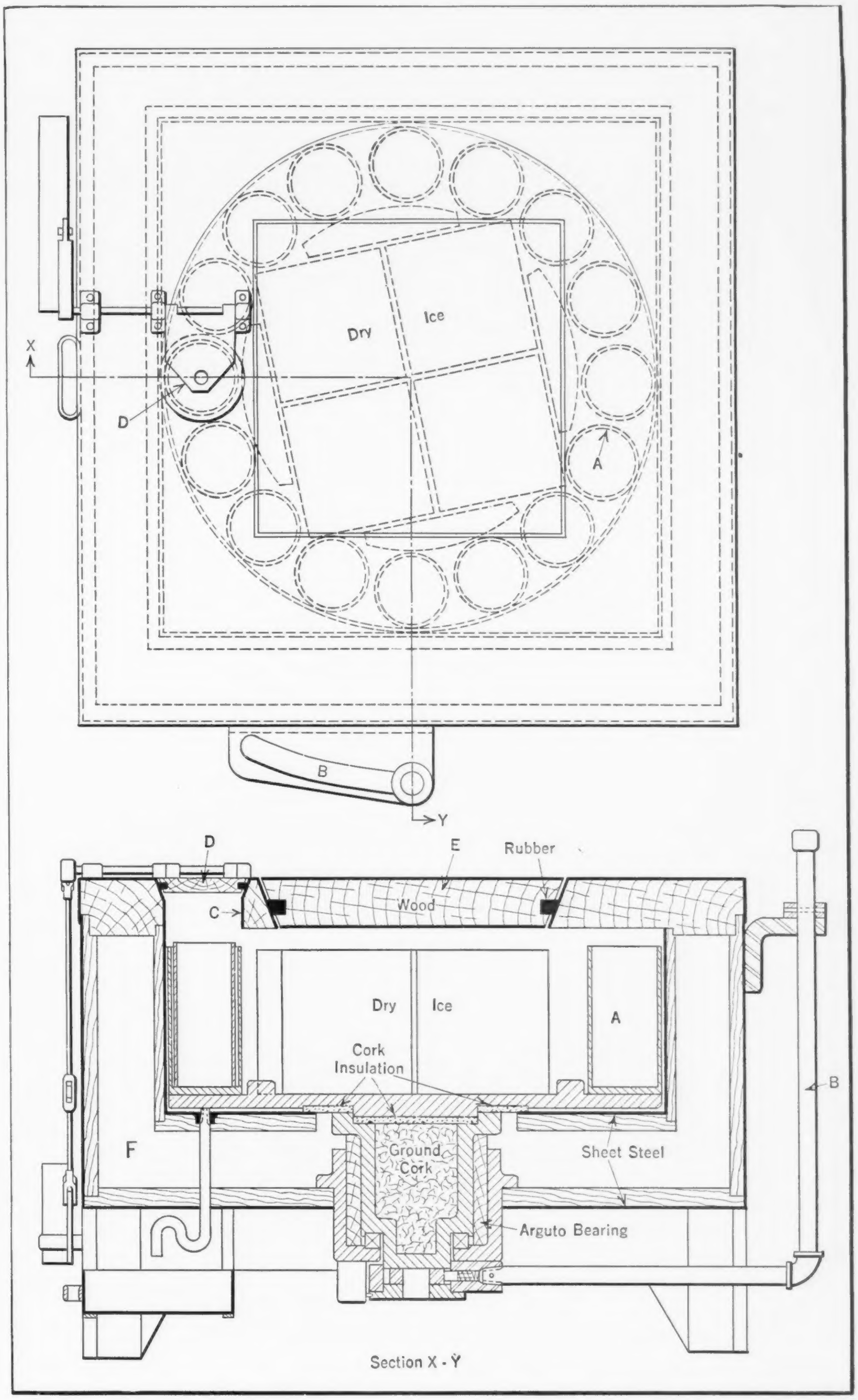


Fig. 3. Construction of a Refrigerator that Maintains an Inside Temperature of 105 Degrees Below Zero. Space F is Filled with Kapok in Blanket Form, for Insulation Purposes

Dry Ice Keeps Aluminum Rivets Annealed

In the construction of airplanes, aluminum-alloy rivets are used in joining the structural members that comprise the framework. These rivets are first

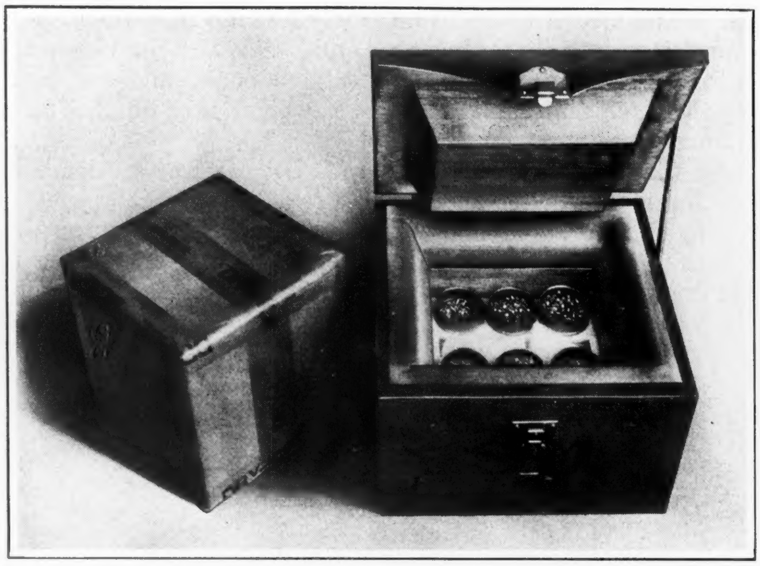


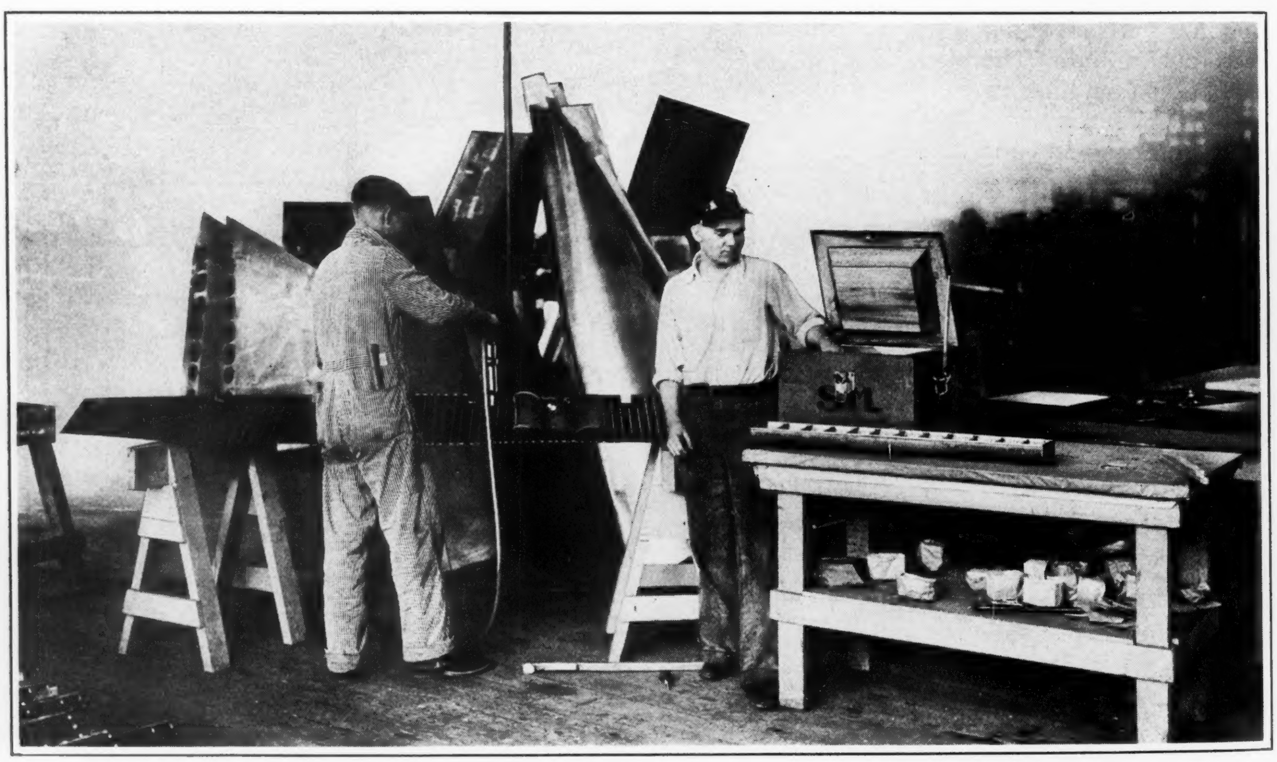
Fig. 4. Dry Ice Refrigerator Used by the Boeing Airplane Co. to Retard the Aging of Duralumin Rivets

heat-treated to soften them and improve their workability. However, these advantages are soon lost if the rivets are allowed to stand at ordinary temperatures after the quench, because they undergo a spontaneous change known as "aging." While this action increases the strength and hardness, it decreases the plasticity, and it is therefore desirable to have the change occur after the rivets have been driven. The aging is rapid at the beginning, and on that account, the general practice in the past was to use the rivets within twenty minutes after they had been heat-treated. This meant the constant heat-treating of rivets throughout the day, even though a comparatively small quantity was being used.

It is a peculiar fact, however, that extremely low temperatures will arrest the aging of the aluminum alloy from which the rivets are made. Because of this, a number of airplane-manufacturing companies have adopted dry ice as a medium for keeping the rivets cold. When this is done, the rivets can be used for at least two weeks after their heat-treatment, although most companies heat-treat a fresh supply of rivets each morning.

In one plant the riveting gangs are provided with small boxes made of balsa wood and measuring 9 by 9 by 9 inches inside. These boxes are fitted in the center with a 6- by 6- by 9-inch metal container which holds about seven pounds of dry ice. Surrounding this container are twelve compartments for various sizes of rivets. The temperature of the rivets is maintained at about 20 degrees F. below zero. The rivets are used quickly after being taken from the boxes, because the aging is resumed when the rivets reach normal room tem-

Fig. 5. Rivets that have been Subjected to the Intense Coldness of Dry Ice are Brought to the Riveters at Intervals of Fifteen Minutes



perature. Another airplane manufacturer keeps the rivets at a temperature of 40 degrees F. below zero to prevent them from aging.

Fig. 4 shows the construction of the refrigerators used in the plant of the Boeing Airplane Co., Seattle, Wash., to prevent the aging of duralumin rivets. The exterior of the box is fir plywood, and the interior is lined with balsa wood. In this refrigerator the cans of rivets rest directly on the dry ice.

Carriers distribute the rivets to the riveters every fifteen minutes, placing them in the compartments of a long tray, such as seen on the table in Fig. 5. Any rivets remaining from his last call are collected by the carrier and reheat-treated the following morning.

Dry Ice is Used for Hardening Corrosion-Resistant Steels

Extensive research conducted in the metallurgical laboratories of the Carpenter Steel Co., Reading, Pa., has shown that certain steel alloys can be hardened appreciably by cooling them to low temperatures. Tests were made mainly on chromium-nickel, nickel-silicon, and other corrosion-resisting steels. Not only were the alloys hardened without discoloration, but unusual physical and corrosion-resisting properties were developed. The machineability of the metals was also improved in some cases by this method.

It may be of interest to summarize briefly the procedure followed in making a series of tests to determine the different responses to cold treatment obtained with small variations in the nickel content of the steel alloys. The tests were made on nine alloys containing approximately 17.50 per cent chromium and 4.73 to 5.54 per cent nickel. These alloys were made into 2-inch square ingots and forged into test bars, 1 inch wide by 1/4 inch thick.

The bars were first quenched in brine from a temperature of 1090 degrees C. (1995 degrees F.); cold-treated at minus 80 degrees C. (minus 112 degrees F.), cooling at the rate of 2 degrees C. per minute; and heated to a temperature of from 100 to 700 degrees C. (212 to 1292 degrees F.) in steps of 100 degrees, cooling in the air in each case. After each heat- and cold-treatment, a Brinell hardness reading was taken and the bars were tested for permeability.

The cold-treatment of stainless-steel parts has been applied to a restricted extent for hardening parts without discoloring them. This practical application consists of simply immersing the parts in a bath of denatured alcohol to which a sufficient quantity of dry ice is added to lower the temperature of the bath to the required point.

Cast Camshafts Replace Forgings

The adoption of electric furnace alloy iron castings in place of forgings for the camshafts of Essex automobile engines, as described by Joseph Geschelin in a recent number of *Automotive Industries*, is a revolutionary step in automotive engineering. This development is of interest to the machine building industry generally, because it introduces a method of producing cast parts having physical properties comparable to those of forgings at a cost much lower than that for forgings.

The patterns for such castings can be completed in less time and at about 25 per cent of the cost of dies. Another advantage is the ease with which the patterns can be changed to suit changes in design. Shapes that could be produced only with great difficulty by forging can be readily produced by casting. Also, the small allowances required for finishing, in the case of camshafts, reduce the machining requirements to rough- and finish-grinding of the cams, eccentrics and bearings, which are accurately spaced on the casting.

Special molds of steel and sand are arranged to chill the surfaces of the cams and eccentrics so that they average about 75 scleroscope, while the bearings and unchilled portions average around 300 Brinell. This treatment eliminates the lengthy copper-plating, heat-treating, carburizing, and straightening operations required when forgings are used.

The iron is made by Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., and is supplied under the registered and copyrighted name "Proferall." This processed-ferrous-alloy is made in three grades, X, XX, and XXX, having tensile strengths of 50,000, 60,000, and 70,000 pounds per square inch. The composition of grade "X" material used for the camshafts, as given by Mr. Geschelin, is as follows: Silicon, 2.20 to 2.35 per cent; sulphur, 0.10 (max.) per cent; phosphorus, 0.20 (max.) per cent; manganese, 0.50 to 0.65 per cent; comb. carbon, 0.55 to 1.00 per cent; total carbon, 3.15 per cent; nickel, 0.40 to 0.50 per cent; chromium, 0.80 to 1 per cent; molybdenum, 0.40 to 0.50 per cent.

The physical properties are: Tensile strength, minimum, 50,000 pounds per square inch; torsional strength (4 degrees twist), 25,000 pounds per square inch; transverse test (12-inch specimen, deflection, 0.23 inch), 6000 pounds per square inch; fatigue resistance, four to five times that of S A E 1020; ultimate compression, 153,000 pounds per square inch; specific gravity, about 7 per cent less than steel; Brinell hardness (unchilled), 300.

Wear tests of the new camshafts, like fatigue tests, have been made both in the laboratory and on the road, covering up to 122,000 miles at high speed. The maximum wear was found to be less than 0.0003 inch, whereas steel shafts subjected to the same tests showed an average wear of 0.001 to 0.0015 inch.

How to Obtain Best Results in Roll-Grinding

First of a Series of Five Articles Giving Complete Directions for Roll-Grinding Operations and Wheel Selection

By H. J. WILLS, Engineer
The Carborundum Co., Niagara Falls, N. Y.

RECENT trends toward higher standards have raised the operation of roll-grinding to the status of a highly specialized art, involving many refinements of detail. In no other field of grinding, as applied to large work, are closer dimensional tolerances combined with a demand for surface perfection and high finishes. Then, too, there is a great variation of work sizes, shapes, materials, and degrees of hardness and density. The greatest variation encountered, however, in this class of grinding is in the individual ideas of the art among the roll users. Rarely do any two individuals agree as to the specific merits of the several types of grinding machines, grinding wheels, roll surfaces, and finishes best suited to well standardized rolling operations.

Too often roll-grinding is done by the application of the cut-and-try method. In the average shop, few records of wheel performance and general procedure are kept for the duplication of results or for improvements. Very little scientific thought has been applied to reducing roll-grinding to a science by the removal of variables and the adoption of standardized procedure. It is with these ideas in mind that the present series of articles has been written.

Relation of Surface to Finish

In the roll-grinding field, as in other fields of machining, it is unfortunate that there are no standards of "surface" and "finish" by which results can be gaged. Perhaps for this reason very few of those responsible for roll-grinding operations agree as to what constitutes a good surface or as to what finish should be applied to that surface when obtained. In fact, the two terms are invariably confused. Some rolls have a high luster which merely disguises a poor surface. Others have a velvet or matte finish that closely approaches surface perfection; this is obtained with a minimum of effort and expense. The application of "finish" is relatively simple, when a good surface is once obtained.

All ground surfaces consist of a series of hills and valleys, the height, depth, and width of which determine the degree of surface perfection. Within certain limitations, a wide latitude of finishes can be applied to these surfaces. Dimensional accuracy, also with limitations, is not necessarily contingent upon either surface or finish.

Wheels for Obtaining a Good Surface

In grinding steel rolls, silicon-carbide wheels are frequently employed, since silicon-carbide produces a high luster. Careful examination of such surfaces, however, will reveal that the luster is due to the reflection of light from relatively deep and narrow grit marks in the surface. Aluminum-oxide wheels, on the other hand, generate surfaces with grit marks that are broad and shallow. The nature of these grit marks is such that less light is reflected, and, therefore, the surface may be less attractive in appearance than one ground with silicon-carbide.

Since roll "finish" is measured by the surface quality of the rolled material, it should be obvious that for steel rolls the aluminum-oxide wheel is more suitable. Cases have been observed of sheets made from rolls ground with a 150-grit aluminum-oxide wheel that were far superior in surface perfection to sheets made from similar rolls ground with silicon-carbide wheels as fine as 500 grit.

Prior to final finishing, it is also important that a roll be ground to a true circumference, the accuracy of which should meet the specifications of the stock to be rolled.

What Constitutes a Good Surface

Before considering the actual application of grinding wheels, it may be in order to discuss briefly the question of "surface." It is quite obvious that the aim is to produce a surface that is of such a degree of perfection that a "pattern" is not reproduced on sheets or strips from the roll. This means simply that the roll must not have a pattern and that the grit marks must be very shallow. To obtain this condition, the surface must be "built up" by a series of cutting wheels of constantly decreasing depth of penetration; few, if any, short cuts will accomplish the desired results. In no type of grinding is luster a true indication of surface perfection.

It is argued by some that without the presence of numerous "flats" on a curved surface, a luster is not possible. If this theory is sound, a dull but smooth finish may be a more positive indication of a good surface. The writer believes that if a good surface is produced by careful generation, it is quite feasible to add a luster by lapping, or with abrasive wheels of special characteristics without creating flats.

In any case, it is of the greatest importance that the common faults of roll-grinding—that is, flats, chatter, grit, and traverse marks—be not covered up by a wheel that is limited to a polishing action. It is an inescapable fact that high accuracy and a fine surface can only be obtained by a cutting action. Any attempt to produce a high finish with wheels that have been dulled by dressing will result only in burnishing, which consists largely of the

folding over of high metal ridges. This action produces a very pleasing appearance, but it lasts only for a very short rolling period, after which the pushed-over metal flakes off from the roll, exposing the original surface defects.

One of the fundamentals of grinding practice is that the degree of surface perfection and finish is definitely limited by the amount of stock to be removed with any one wheel. The logical conclusion is that to secure a good surface, time is as important as any other factor. Attempts to reduce this element of grinding cost will react on the quality of the work. High-quality rolls, like fine watches, can be produced only by skill, care, and expense.

Types and Characteristics of Rolls

Rolls requiring grinding are applied to a wide range of products, including metal sheets, strips and foils, paper, flour, paint, felt, linoleum, textile, printing, rubber, sugar, ink, soap, etc. These applications involve rolls made of steel, gray iron, chilled iron, brass, paper, felt, hard and soft rubber, granite, and numerous alloys. Some forming rolls are ground, but the majority are turned, owing to the impracticability of shaping the wheels to the numerous contours needed.

One of the variables met with in roll-grinding is found in the metallurgical characteristics of the rolls. Metal variations should always be kept in mind. Hardness, tensile strength, ductility, composition, etc., when varying from roll to roll, materially influence the results obtained in grinding practice. Rolls will vary somewhat in the making, due to conditions such as pouring temperatures, molds, forging procedure, etc. Heat-treating, too, is a source of possible variations. Chilled and gray-iron rolls alter somewhat by aging, particularly after first cuts have been taken.

Problems Introduced by Roll-Grinding Machine

It is a generally accepted fact that roll-grinders of different makes require wheels of widely different characteristics, even when used on rolls of similar specifications and requirements. The wheel selection must be made to suit the grinding machine as well as the work.

The heart of the grinder is the wheel-spindle, since this largely controls chatter, work concentricity, burning, and scoring, as well as the grit, grade, and bond of the wheels. A reliable high-quality ball or roller bearing, or a properly lapped cap or sleeve bearing of bronze or babbitt metal, with the right oil and heat clearance, will permit soft wheel gradings. Conversely, a wabbly or vibrating spindle requires harder gradings and generally an organic bond to prevent chipping and chatter. A spindle in poor condition, regardless of the wheel that is used, will result in poor grinding.

Direct-driven spindles, if connected to a motor through a coupling, require careful alignment. Too much dependency must not be placed on the coupling to take care of misalignment. If the motor is integral with the spindle, a very careful balancing of the assembled unit is essential. With integral mounting of the motor and spindle, stresses, causing side pull, often result in hammering of the wheel through vibration set up by the rotating elements.

Whipping or driving belts or chains, uneven belts, poor belt splices, and faulty work-head thrust bearings and work-driving gears will cause vibration. Worn guide-ways, loose headstocks and tailstocks, poor machine foundations, building vibration, weak neck-rests, and lack of lubrication on necks are well-known causes of vibration and chatter, but are frequently neglected.

Another factor often neglected is the proper heating up of the spindle bearings before grinding, especially for finishing cuts. Heating is necessary to reduce spindle-bearing clearance.

For very fine precision grinding, high-grade babbitt-metal bearings are recommended, as they permit closer running fits when heated. Bronze bearings should be tightened down to a minimum clearance for finish cuts on rolls requiring super-finishes.

When several grinders are available, it is recommended that one grinder be used for roughing only and another for finishing. This arrangement allows the finishing grinder to be kept at a higher standard of perfection than would be the case when only one machine is used for both roughing and finishing.

Methods of Roll Mounting

Chilled iron and steel rolls are, in the majority of cases, of such size as to necessitate supporting the weight on their necks on neck-rests or stays. As these neck-rests frequently have an insufficient bearing surface, there is a tendency for the necks to become heated, which, especially in steel rolls, is very objectionable, inasmuch as it causes misalignment through unequal expansion, resulting in uneven grinding.

Some machine builders advocate supporting the rolls on both necks and centers, particularly rolls of the larger sizes. Since the necks invariably wear eccentric relative to the centers, this combination support necessitates frequent redressing of the necks. This, however, is strongly advocated in any case, as, too often, roll bodies are improperly ground because of eccentric necks. Cases have been observed where burns and oval roll bodies were caused by oval necks. With the exception of those having anti-friction bearings, rolls can be improved and their life increased by more frequent dressing of the necks.

For best results, roll supports or rests should be somewhat shorter than the length of the journal bearings, unless the necks are newly ground. The width of the rests may vary. Theoretically, they cannot be too wide, but the different diameters encountered would make it advisable to confine the width to a minimum. This is best accomplished by

having flat rest contact surfaces. In the case of two-point neck-rests, the front rest should be of such an angle that the roll is forced positively, by its own weight, against the rear neck-rest, which should be set somewhat above the horizontal center line of the roll to prevent climbing on the part of the roll. The use of a hold-down clamp to steady the roll is strongly advised. This should be placed directly on top of the roll over the rests, and should be easily adjustable by hand.

In mounting rolls of small dimensions on work-centers, it is essential to maintain both machine and roll centers at a high degree of perfection. Center location and fit should be checked for each grinding operation. When the rolls are required to be of extreme accuracy, the roll centers should be rather large in proportion to the roll size, but the length of center contact should not be more than three-eighths of the depth of the center hole. Good lubrication is, of course, essential, and white lead is recommended.

Lubrication of Rests During Grinding

A point of vital importance often neglected is that of lubricating the rests properly during grinding. Cases have been observed where the addition of a single drop of oil on the neck-rests has changed the character of the grinding materially. The reason for this is that, on account of friction, there is a tendency for the roll to creep or climb upward and forward, thus pressing into the wheel. Lubrication decreases this friction and the roll returns to its natural position, which is away from the wheel. Variations in frictional resistance at the necks during finishing cuts is fatal to high-quality surfaces. Oil-soaked wool waste or felt pads should be kept on the necks to maintain constant and even lubrication.

Rolls should be driven by at least two points, and care taken to see that equal pressure is applied at each point, in order to prevent the roll from wabbling. These driving points and their faceplate should be concentric with the roll axis. Some cushion between the driving points and work is advisable.

Roll Speeds for Best Results

Theoretically, work speeds could be generally increased to the betterment of surface conditions. As is well known, it is impossible to grind a perfect cylinder, due to unavoidable minute flats and imperfections reproduced from the grinder. Obviously, the faster the work travels past any point on the wheel, the narrower these flat spots will be, while the wheel marks will be elongated, and, consequently, less visible.

In practice, however, there are several factors that upset this theory. High work speeds may introduce vibration in the roll and cause heating at the work supports, with detrimental effect. For all "finishing-out" passes, it is essential that the traverse, *per revolution of the work,* be at an absolute minimum. High work speeds increase this ratio of traverse to work speed, and, therefore, must be avoided. A good rule for work speeds (assuming a proper wheel grading) is to set the speed at the maximum obtainable without introducing vibration for all truing passes, and at the minimum *smooth* rotation point for finishing passes.

Coolants and Filters

The choice of coolants is necessarily controlled by local conditions and preferences. In any case, the coolants must be clean and soft. Hard water should not be used with soluble oils, as there is a tendency for it to form insoluble soaps on the roll surface, which may interfere with the cutting action of the wheel. When soft water is not available, use clean soda water in tank and filter.

Too much cannot be written to advocate the use of filters. Dirty coolants may, and do, nullify to a degree all care taken in the maintenance of grinding machines and the proper choice of wheels. Scratches on the roll surface, frequently blamed on the wheel, are usually caused by dirt carried to the roll by the coolant. It is not generally recognized that dirty coolants necessitate more frequent dressing than might otherwise be required, since the dirt roughens the wheel face and interferes with proper grinding action.

Good, efficient filters are necessary for fair results at any stage of roll-grinding; for high finishes, they are indispensable. Several thicknesses of cambric may help to some extent, but will not take the place of a good filter.

In changing to finer wheels, it is recommended that the wheel guards be thoroughly washed.

Strong soda solutions should be avoided with shellac- and resin-bonded wheels, as there is some danger of disintegration of the bonds. Such wheels, when removed from the grinder for storage, should be washed with clear water.

In the remaining installments of this article, to be published in coming numbers of MACHINERY, the subjects of wheel selection, factors affecting good roll-grinding, and wheel dressing will be dealt with, followed by specific directions for the grinding of steel rolls, chilled-iron rolls, jewelers' rolls, chromium-plated rolls, paper-mill rolls, rubber rolls, and many other classes of rolls generally used in industry. The lapping of rolls will also be dealt with.

* * *

Statistics compiled by the Bureau of the Census, Washington, D. C., pertaining to the electrical machinery industry for 1931 show that in that year there were 1389 establishments making electrical machinery, apparatus, and supplies, with a total number of wage earners of 180,000. The total value of the products of the industry was $917,500,000. Of this amount, motors accounted for $103,000,000.

AVERAGE STRENGTH DATA FOR NON-FERROUS METALS—1

Material Letters (a) etc., Indicate Foot-notes	Elements Identifying Composition, Approximate Percentages					Tensile Strength, Pounds per Square Inch	Yield Point, Pounds per Square Inch	Elongation in 2 Inches, Per Cent
	Copper	Zinc	Tin	Aluminum	Iron			
Aluminum Castings (a)	7.75	0.20	...	90	....	19,000	......	1–2
S A E No. 33	7.00	2.50	...	87	1.50	21,000	......	1–2.5
S A E No. 36 (b)	7.75	....	...	88	1.10	21,000	......	1–3
S A E No. 37 (c)	0.30	0.20	...	85	0.80	27,000	......	5–15
S A E No. 39 (d)	4.00	....	...	90	1.00	36,000	......	0–2
Aluminum-Bronze Castings (e)	88	....	0.5	8	3.25	65,000	25,000	20
A S T M (f)	89.5	....	0.2	9.5	....	80,000	50,000	4
S A E No. 68	86	....	...	8	3.50	65,000	20,000	20
Aluminum Sheet (g)	....	....	...	99	....	12,000	......	15–30
No. 2 Half-hard	....	....	...	99	....	16,000	......	3–7
S A E No. 26 (h)	4	....	...	92	....	55,000	30,000	9–18

(a) Society of Automotive Engineers (S A E) standard composition No. 30. Used more extensively in the automotive industry than all other light casting alloys combined. Specific gravity 2.83. Tensile strength applies to test bars 1/2 inch in diameter cast in sand without machining off skin. Used for crankcases, steering-wheel spiders, transmission cases, hub caps, etc.

(b) Contains 1 to 1.5 per cent silicon, not over 0.2 per cent zinc, not over 0.3 per cent manganese, and not over trace of magnesium. Test specimens cast in sand without machining give tensile strengths from 19,000 to 24,000 pounds per square inch. Specific gravity 2.83. Developed from No. 30 by adding iron to improve casting qualities and eliminate cracks and shrinks on difficult castings.

(c) Contains 12 to 13 per cent silicon. Especially resistant to salt water. Test bars cast to size in sand show tensile strengths from 24,000 to 31,000 pounds per square inch and elongations from 5 to 15 per cent. These properties are obtained only if molten alloy is subjected to special process immediately before pouring. Specific gravity 2.68. Ratio of yield point to ultimate tensile strength lower than some of the other aluminum casting alloys.

(d) Retains strength at elevated temperatures better than many of the other aluminum alloys. Used for pistons and cylinder heads of aircraft engines. Contains 1.8 to 2.3 per cent nickel, 1.2 to 1.7 magnesium, not over 1.0 iron, and not over 0.7 silicon. Test specimens cast in sand and properly heated have tensile strength of 30,000 to 42,000 pounds per square inch. If not heat-treated, tensile strength is about one-third less.

(e) Specification, American Society for Testing Materials (A S T M) for aluminum-bronze castings, grade A, which does not respond to heat-treatment.

(f) Grade B aluminum-bronze castings, heat-treated.

(g) A S T M standard temper No. 1 or "soft" sheet. Aluminum percentage is minimum. Minimum elongation varies from 15 per cent for sheets 0.019 inch thick to 30 per cent for sheets 0.258 inch thick.

(h) Same as Duralumin, Dural, or 17 S. Strength data applies to heat-treated sheets. This alloy is used in the wrought condition either rolled, drawn, forged, or extruded. Composition includes 0.2 to 0.75 per cent magnesium and 0.4 to 1.0 per cent manganese.

MACHINERY'S Data Sheet No. 241, New Series, January, 1933

AVERAGE STRENGTH DATA FOR NON-FERROUS METALS—2

Material Letters (i) etc., Indicate Foot-notes	Elements Identifying Composition, Approximate Percentages				Tensile Strength, Pounds per Square Inch	Yield Point, Pounds per Square Inch	Elongation in 2 Inches, Per Cent
	Copper	Zinc	Lead	Aluminum			
Aluminum, Wrought (i)	4.5	..	....	92	60,000	......	16–22
S A E No. 27 (j)	4.5	..	....	92	50,000	22,000 (j)	15–22
Aluminum Bronze, Wrought (k)	88	..	....	8	75,000	37,000	25
Brass Casting (l)	84	5	5	..	27,000	12,000	16
Yellow Brass (m)	63	33	3	..	25,000	12,000	20
Manganese Bronze (n)	57	42	0.15	..	60,000	30,000	15
Brass Sheet (o)	66	33	0.30	..	45,000	......	27.5
Half-hard	66	33	0.30	..	52,000	......	15
Hard	66	33	0.30	..	67,000	......	5
Extra-hard	66	33	0.30	..	80,000	......	2
Spring	66	33	0.30	..	87,000	......	1
Soft Anneal	66	33	0.30	..	40,000	......	42

(i) S A E alloy No. 27, fully heat-treated. Contains 0.5 to 1.1 per cent manganese and 0.5 to 1.1 per cent silicon.

(j) Strength data applies to S A E alloy No. 27 given "solution" heat-treatment but not the "precipitation" heat-treatment. This leaves it in a more workable condition. Yield point range, 15,000 to 30,000 pounds per square inch.

(k) S A E No. 69. Minimum strength data for annealed or hot-rolled bars. Contains 2.5 to 4.50 per cent iron. Wrought shapes, rods, and bars combine unusual strength with good bearing and anti-corrosive qualities.

(l) S A E cast-brass alloy No. 40, known as "red brass." Contains 5 per cent tin.

(m) S A E No. 41. Intended for commercial castings where cheapness and good machining properties are important. Maximum tin, 1.00 per cent and maximum iron, 0.50 per cent.

(n) S A E cast-brass alloy No. 43, commonly known as "manganese bronze."

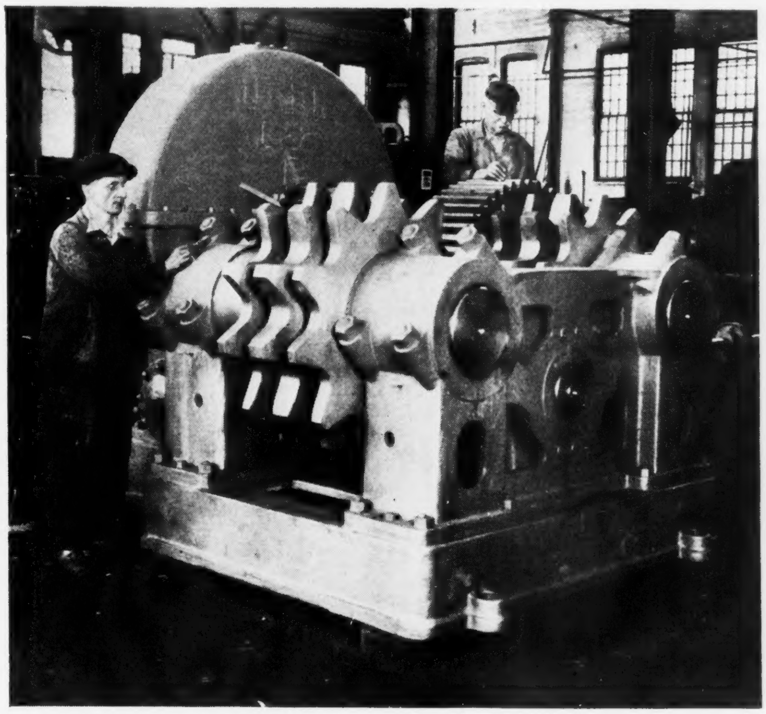
(o) Commercial "high-brass" sheet, commonly used for drawing, stamping, and bending. A S T M specification. Temper quarter-hard.

MACHINERY'S Data Sheet No. 242, New Series, January, 1933

Notes and Comment on Engineering Topics

The Soviet Union ranks second to the United States in unmined coal resources, and has approximately one-third of the known oil resources of the world.

A new type of glass is being manufactured at St. Helens, Lancashire, England, which, it is believed, may revolutionize the plate-glass industry. It is stated that the new plate glass is an ordinary glass that has been subjected to a special treatment. It retains all the properties of ordinary plate glass, but will withstand a load of from three to four times that to which ordinary glass can be subjected. A steel ball that will break an ordinary piece of plate glass when dropped from a height of 20 inches, must be dropped from a height of 12 feet before it will break a corresponding piece of the new glass. It will bend three or four times as far as ordinary glass before breaking. Another test to which it has been subjected without breaking is that of pouring molten lead at a temperature of 620 degrees F. on it. At 15 degrees F. below zero, it resists breakage as well as at ordinary temperatures. When it breaks, it shatters into tiny fragments which are too small to cause damage.



Putting the Finishing Touches to a Gate Hoist for the Hoover Dam at the Scott Foundry of the Reading Iron Co. The Two Sets of Hoisting Mechanisms Weigh 140 Tons; Lifting Capacity, 216 Tons. The Hoists are Operated by Huge Chains Actuated by Geared Sprockets

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Electrical cables for power lines are now being made with a jacket of a material that has all the advantages of rubber, but is claimed to be superior in its resistance to chemical action, sunlight, oil, and vibration. The material is known as "Thiokol." The General Cable Corporation of New York will make the new jacketed cables under a license agreement with the Thiokol Corporation, Yardville, N. J.

A circular test track has been added recently to the equipment in the laboratory of the National Crushed Stone Association by means of which it will be possible to tell in advance of building how finished roads will stand up under traffic. The track is 14 feet in diameter and has a runway 18 inches wide on which test surfaces can be built up to a maximum thickness of 6 inches. The runway rests on a reinforced-concrete base, 6 inches thick and 2 feet 2 inches wide, including the curbs.

In the base a system of hot-water pipes is laid in such a manner that the entire runway can be kept at a constant temperature. By means of this system, any desired temperature up to 140 degrees F. can be maintained and winter conditions can be simulated by simply substituting a refrigerating plant for the heating plant. By flooding the track, it is possible to study the effects of continuous moisture on various test surfaces. A wheel is used as the load-applying mechanism.

If experience is a very expensive teacher, it does not follow that "the other fellow's experience" cannot be taken advantage of at less cost.

—The Economy Sceptre

EDITORIAL COMMENT

A wise and keenly observant British business man, in the course of a discussion of depression problems, recently remarked that one of our most difficult tasks in times like the present is to keep from trying to effect foolish economies.

What Price Economy? We Sometimes Pay Too Dearly for Savings

How much wisdom there is in that! When we have gone through hard, trying times, when we have seen disaster overtake so many, it reflects no small ability to be able to keep one's balance and to see and value things in their true proportions. When hysteria is in the air and panicky impulses frequently supply the urge to action, it takes courage and calm judgment, in trimming the ship so that it will ride the storm, to keep from throwing overboard a valuable part of the cargo that will be needed later and that it may take years to regain.

A good time to find out what an economy is going to cost is before it has been put into effect.

Rehabilitation Offers a Program of Action for the New Year

The spirit of optimism that is abroad as the old year changes into the new is, perhaps, of greater significance than the slight signs of recovery in business and industry that are being recorded by statisticians and economic observers. There is every reason to believe that the low point of the depression was passed last summer. A gradual, though slow, recovery has been recorded ever since; and most men whose judgment is valued by the business world believe that this improvement will continue during the coming year.

The time, therefore, is ripe for the rehabilitation of machinery and plant that has been advocated throughout industry during the last few months. The time has come for putting good intentions into action. During the last three years, most factories have replaced little, if any, of their old equipment, some of which was obsolete even in 1929. Much of it needs to be replaced in order to meet present-day competition.

Many plant managers seem to believe that when a machine is in good condition, it is not obsolete; but the machine may, nevertheless, be behind the times in productive capacity. It is much the same as if one had bought an automobile of the best make in 1923 and put it in a garage without using it. The car would still be brand new, yet it would be so obsolete that no one could be induced to pay more than a fraction of the original price for it.

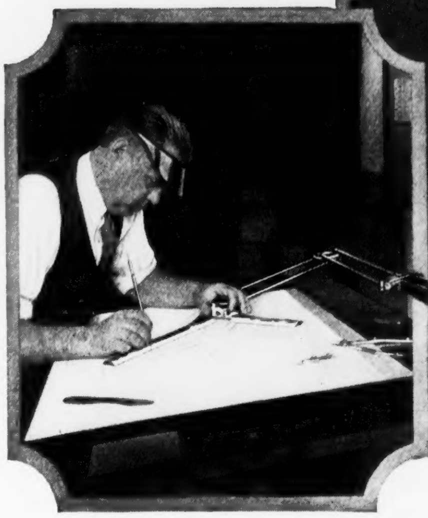
There is much machinery equipment that is almost in this class; it is in good mechanical condition, but it has been out-distanced in producing capacity by newer developments. The ushering in of the new year offers a good opportunity to review the shop and its equipment and to make a list of all that ought to be replaced.

There is Also a Chance for Rehabilitation in Management Ideas

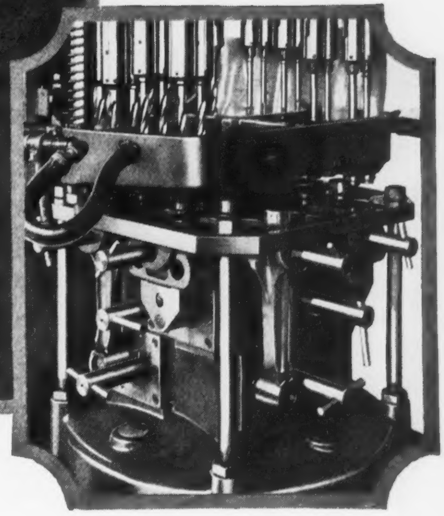
Management methods become obsolete, as well as shop equipment. Many of the principles of business management that seemed perfectly good in 1928 have been proved by the experience of the last five years to be quite unsuited to present-day requirements. We have entered a new era, not only in engineering and production, but also in business and management. We need to take stock of what is obsolete in every activity of industry. If, in so doing, we keep all that has proved to be permanently useful throughout the years, and sift out that which had a part in causing our present difficulties, we are undertaking a real program of rehabilitation, the results of which will eclipse all past achievements.

Giving the Machine Due Credit for a Few Achievements

The machine has served as a convenient scapegoat on which to blame all the ills of the depression. But let us look for a moment at the other side of the balance sheet. What advantages can be charged to the credit of the machine? Here are a few: In the last fifty or sixty years, working hours have been reduced first from twelve to ten, and then from ten to eight a day. In some industries the five-day week has been established. The standard of living for the great majority of the population has been raised to a level undreamed of even at the beginning of the century. Such conveniences as electric light, telephones, and refrigeration are the creation of the machine. Combined conveniences and luxuries, such as automobiles, and recreational facilities, such as the radio and motion pictures, have been made possible by the machine. Civilized life is inconceivable without the machine.



Design of Tools and Fixtures



Pistol-Grip Dial Gage for Measuring Bores Accurately and Rapidly

By D. L. BROWN, Summit, N. J.

Ordinarily, in internal grinding operations, "Go" and "Not Go" plug gages are used for checking the ground holes. At best, this method is awkward, and as a rule, more time is consumed in measuring than in the grinding operation itself—especially when the tolerance is small. Moreover, the life of these gages is relatively short, due to the fact that fine particles of grinding dust get between the gage and the work.

The illustration shows a gage designed by the writer to overcome the objections mentioned. It can be used either as a working or an inspection gage. To facilitate handling, this gage was made with a pistol grip. It is enclosed to exclude dust from the working parts. A dial indicator *A*,

Gage with Pistol Grip for Rapidly Measuring the Diameters of Holes Having a Tolerance as Small as 0.0001 Inch

graduated in thousandths of an inch and having a gaging movement of 0.1 inch, is mounted in the grip. By means of the multiplying lever *B* each graduation on the dial represents 0.0001 inch relative to the diameter of the hole being measured. This lever is pivoted at *C* in the barrel of the gage, and its right-hand end engages a slot in one end of plunger *D*. The other end of the plunger rests upon the indicator test point. Spring-actuated plunger *E* serves to maintain contact between lever *B*, plunger *D*, and the indicator test point.

At the left-hand end of the gage barrel are secured two plugs in which the two screw pins *F* are mounted. These pins, together with the movable pin *G*, serve as measuring points for checking the hole diameter, and are interchangeable for holes of different diameters. Movable pin *G* is secured in the plunger *H*, which is held against lever *B* by a light coil spring.

Trigger *J* engages a slot in plunger *D*, and when depressed, raises lever *B* and causes pin *G* to recede, thus allowing the barrel end of the gage to enter the hole to be checked. The trigger is then released and all three points come in contact with the hole. Provision is made for squaring up the gage with the work through the collar *K*, which is adjustable for checking holes at various depths. In squaring up the gage, the three projections on the collar must be in contact with the facing at the end of the hole.

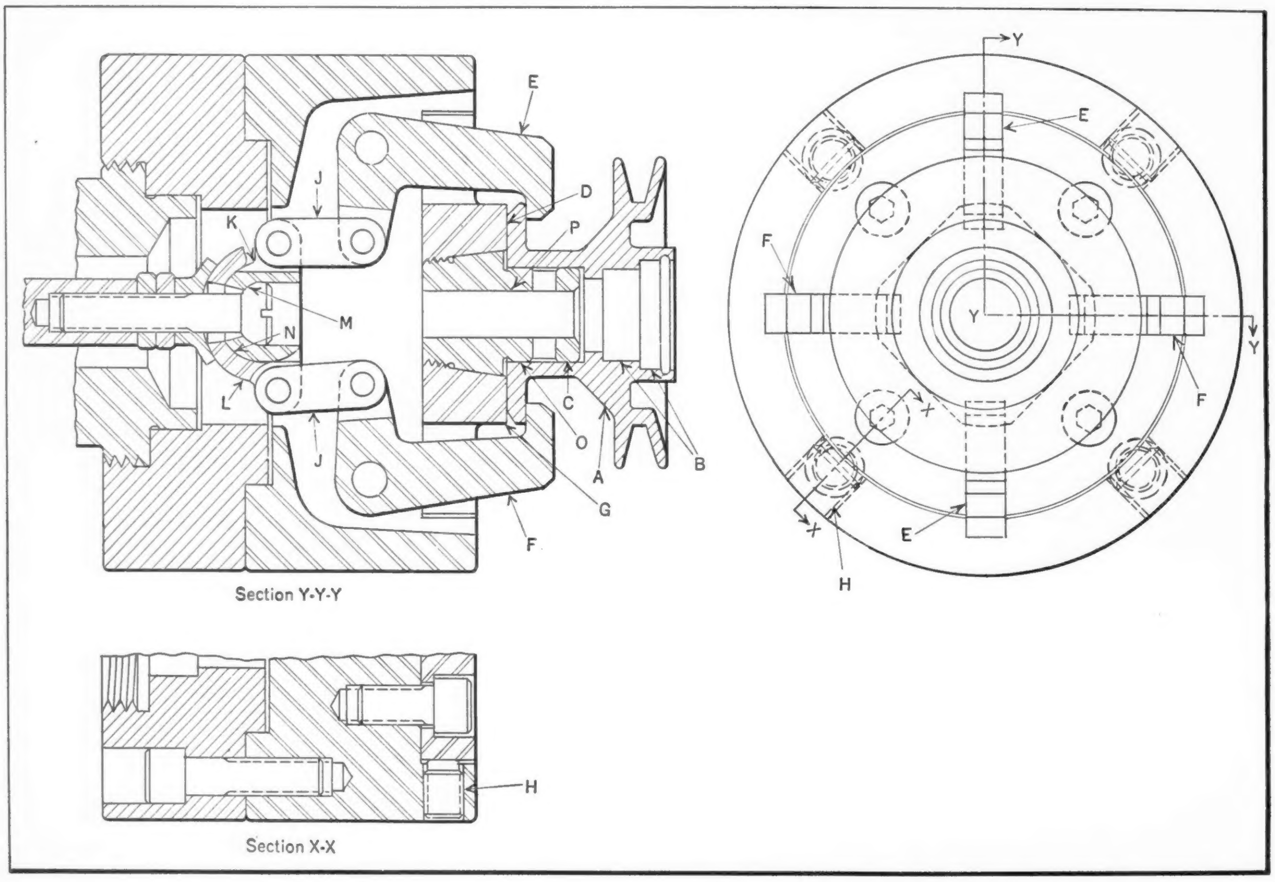
A master gage *L* is used in setting the indicator to zero. This gage, of course, has a bore diameter equal to the basic diameter of the hole to be checked. Thus when the trigger is released, the deflection of the indicator pointer will show the actual amount in ten-thousandths that the hole is over or under size.

Four-Jaw Pneumatic Chuck with Equalizing Arrangement

By GEORGE L. PYRITZ, Indianapolis, Ind.

The air-operated chuck here illustrated is one of the many special fixtures that have been used to advantage on turret lathes. This chuck was designed to hold the cast-iron fan hub indicated at *A* for boring the hole *B*. These hubs are made in various lengths and with different bore diameters. The holes *B* and *C* are bored for ball and taper roller bearings, and must be concentric within close limits. The hole *C* is bored and the flange *D* faced in a previous operation. Formerly, a faceplate, in which was mounted a stub arbor for locating the casting centrally, was used to bore hole *B*, the casting being held against the faceplate by two heel clamps.

The chuck shown, however, has greatly shortened the loading time and paid for itself many times. The insert arbor *O* is made of casehardened steel and ground, and is a close fit in the hole *C*. It can



Air-operated Chuck with Four Equalizing Jaws that Compensate for Variations in the Thickness of the Work

easily be removed and replaced by arbors of different sizes to suit the hole in the casting to be machined. The fingers E and F are hardened steel. They hold the work against the hardened and ground face G. The four adjusting screws shown at H are provided for truing up the insert arbor.

In operation, the draw-bar is moved to the left by means of an air cylinder located at the rear of the machine. This closes the fingers on the flange of the work through the action of the links J and the puller arms K and L. The spherical surfaces of these arms at M and N provide for equalization of the opposite fingers to compensate for slight variations in the flange thickness. These fingers hold the casting tight enough so that a driver is unnecessary. The ground hole P in the insert arbor is used for piloting the boring-bar.

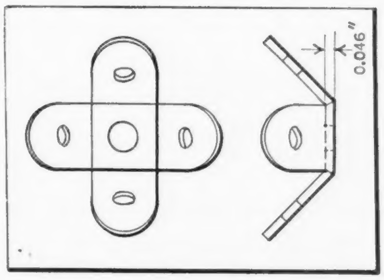


Fig. 1. Brass Terminal Clip Made by Die Shown in Fig. 2

Die for Making 10,000 Terminal Clips an Hour

By W. C. BETZ, Master Mechanic
Fafnir Bearing Co., New Britain, Conn.

In making brass clips for radio receivers at the rate of 10,000 an hour, a three-stage, progressive die is employed for piercing, blanking, and forming. The clip, shown in Fig. 1, has four ears bent at the same angle. The die (see Fig. 2) is designed for use on a single-action, roll-fed press operating at 200 strokes per minute.

To insure alignment, the die members are built into a die set of the pillar type. Although there are five stations in the die, only three are working stations. With this arrangement, the intermediate idle stations (second and fourth) provide ample room for die members of sturdy construction, which is required in dies of this type.

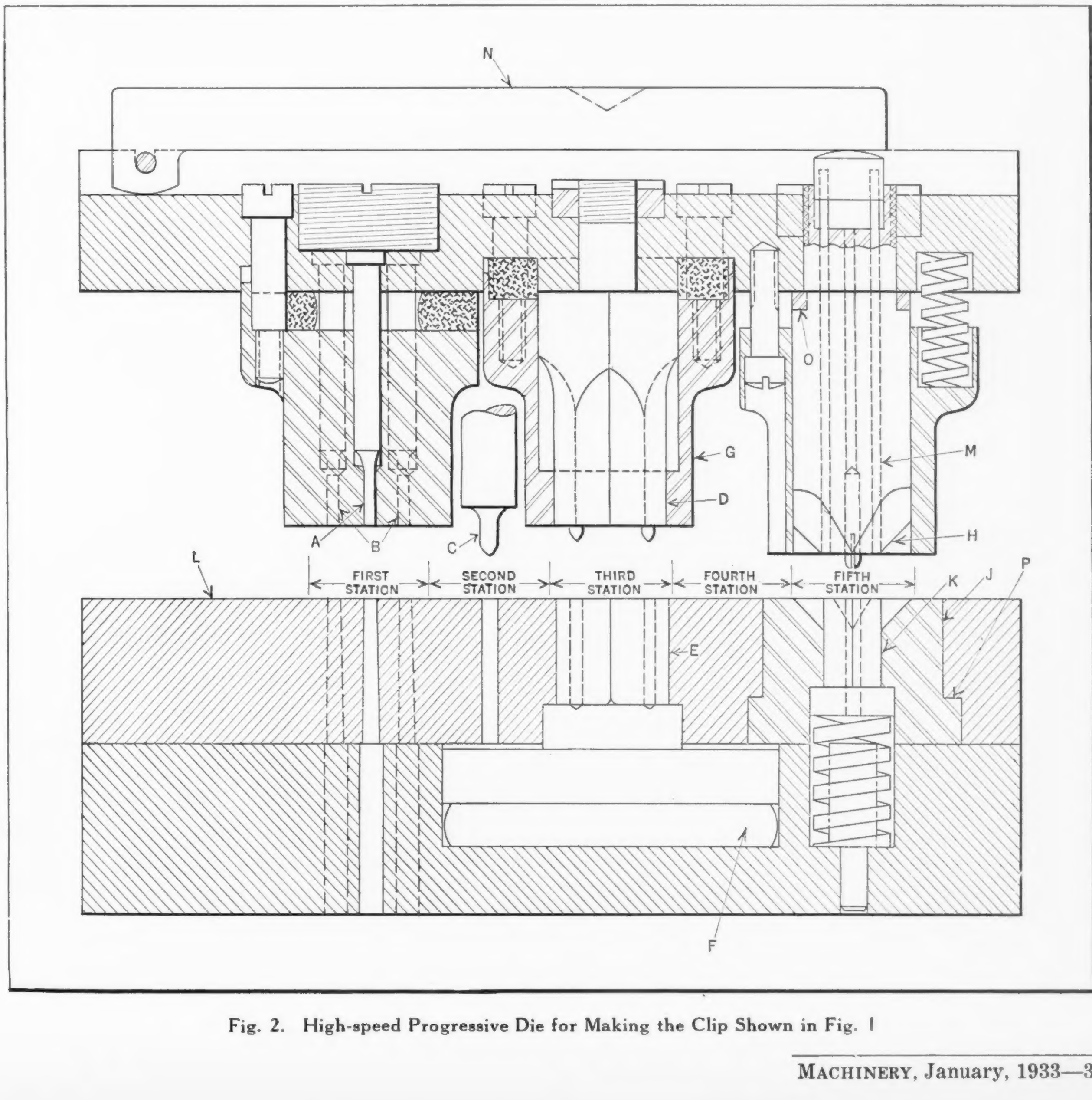


Fig. 2. High-speed Progressive Die for Making the Clip Shown in Fig. 1

At the first station, the five holes are pierced by the punches A and B. At the second station, the pilot C merely locates the strip. At the third station, the clip is blanked out by the punch D and then pushed back into the strip by the pad E, which is backed up by a rubber buffer F. Stripper G is also backed up by a rubber buffer and serves to force the strip from the punch. This stripper also holds the strip down solidly on the face of the die while the clip is being returned to the blanked hole.

At the next station, as at the second station, no operation is performed. At the last station, however, the four ears of the clip are formed between the punch H and the die J. As the ears are being formed, the center of the clip is gripped between the end of the punch and the pad K, and at the bottom of the stroke, is flattened between these members. On the return stroke, pad K pushes the finished clip up through the strip, after which the clip is carried upward during the remainder of the stroke by means of the spring pilot. At the top of the stroke, the clip is ejected from the punch by the pins M, which are actuated by the positive knock-out bar N. On leaving the punch, the clip is ejected from the die by compressed air through the action of an automatically operated valve.

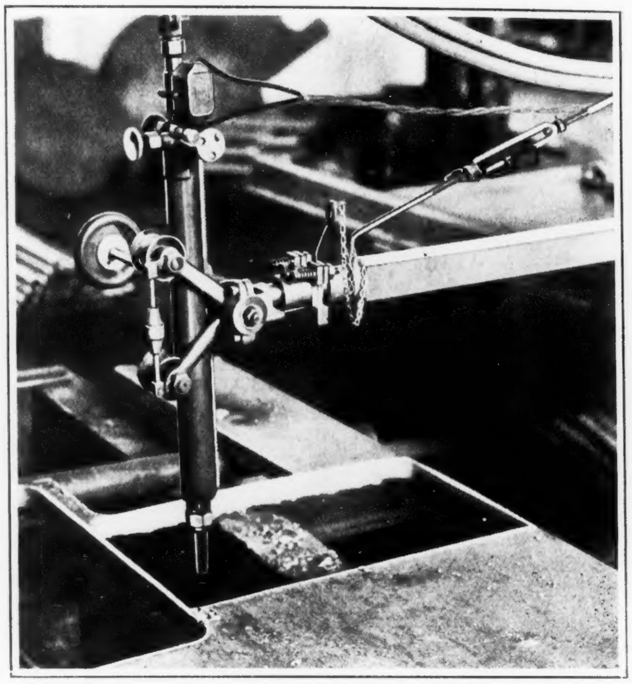
A great deal of pressure is required to return the blank to the strip at the third station. For this reason, the area of the pad F should be very large, and the blanking punch should be set to shear only about three-fourths through the stock. To facilitate adjusting the height of the punch—after grinding the other punch members—collar O is provided. The thickness of this collar is reduced an amount equal to that ground off the punch faces. Adjusting the height of the die member J after sharpening die L is done by grinding a suitable amount off the bottom of the die and removing the shims provided at P.

Tilting Arrangement for Torch-Cutting Machine Prevents Pitting in Starting Cut

By J. G. WEBER, JR., Cincinnati, Ohio

Anyone who has had to machine blanks cut out by a torch-cutting machine has doubtless experienced difficulty in cleaning up the spot on each piece where the flame burned through to start the cut. The remedy usually employed is to allow more stock for finishing. To prevent this loss of machining time, the arm of the torch-cutting machine was fitted with a tilting arrangement for starting the cut at some distance from the surface to be finished subsequently. As shown in the illustration, the tilting arrangement consists of a hinge and sockets which fit the corresponding parts of the torch-holder and arm. The hinge is restrained at the top by two springs and separated by a small wedge.

The operation of the device is simple. After the cut is lined up and the tractor is set to start, the torch is tilted forward slightly against the action of the springs and the wedge inserted in the opening in the hinge. This throws the cutting tip a little off the line of the cut. The flame is then lowered and the metal burned through, after which the wedge is removed from the hinge and the tractor motor started. As the cut begins, the flame moves up to the line so that an unburned contour is obtained.



Torch Arm of a Cutting Machine Equipped with a Hinge for Tilting the Torch in Starting the Cut to Prevent Burning or Pitting on the Outline

When the true contour must be on the inside as, for instance, in the case of a high-pressure pipe flange, the cut will have to be started at a point diametrically opposite that shown. A tilt to the cutting tip will then result in the starting pit or burn remaining in the scrap.

A Fool-Proof Starting Stop for Progressive Dies

By H. BERNARD

Commenting on the starting stop for blanking dies described on page 126 in October MACHINERY, the writer believes that this design could be greatly simplified by substituting a "pull out" plunger for the double plunger arrangement shown. The plunger suggested could be provided with a finger ring or knob and be backed up by a spring, so that the stop would be normally in position to stop the strip. It would be a simple matter then to pull the plunger out to allow the stock to feed to the next station. Another advantage of the single plunger is that less machining is required for its installation.

Heat-Treatment of Aluminum Alloys

Results Obtained by Annealing, and the Effect of Applying Solution and Precipitation Heat-Treatments

By DOUGLAS B. HOBBS
Aluminum Company of America

THE heat-treatment of certain aluminum alloys exerts a marked influence on their physical properties and forming characteristics. The discovery of the heat-treatment process for aluminum alloys can be attributed to Alfred Wilm who, about twenty-five years ago, developed several aluminum alloys under the trade name "duralumin" whose properties could be materially enhanced by heat-treatment. Since then, a number of aluminum alloys have been introduced that are susceptible to heat-treatment. Chief among these are the strong aluminum alloys, such as 25S and 51S, and the cast aluminum alloy 195. Some of the aluminum-silicon alloys are also amenable to heat-treatment. The heat-treating processes commonly employed in connection with the cast and wrought aluminum alloys include: (1) Annealing; (2) solution heat-treatment; and (3) precipitation heat-treatment.

Annealing to Relieve Strains in Cast and Wrought Aluminum

When an aluminum alloy product is rolled, drawn, forged, extruded, or otherwise cold-worked, it is strain-hardened, which results in an increase in strength and a decrease in elongation. It is not, therefore, in the condition in which it can be most readily worked. In the case of castings, strains are often set up during solidification and cooling. To relieve such strains in either cast or wrought aluminum products, the material is heated to a suitable temperature, such as 650 degrees F., and slowly cooled. This treatment is termed "annealing."

Solution heat-treatment is employed to bring the soluble constituents of the alloy into solid solution and retain this solution in a supersaturated condition. This is accomplished by heating the alloy at an elevated temperature for a sufficient length of time to complete the solution of the soluble constituents and rapidly cooling the alloy from this temperature by quenching in cold water to hold the soluble constituents in solution.

The heat-treating temperature depends, of course, upon the composition of the alloy, but as a rule, will fall within the range of 900 to 960 degrees F. The time the alloy must be held at the heat-treating temperature is a function of the form and thickness of the material. For example, thin gage sheet may require less than one-half hour at the heat-treating temperature, while castings may require between eighteen and twenty-four hours.

The metallurgical phenomena involved in solution heat-treatment can best be illustrated by describing the change in the arrangement and condition of the soluble constituents in one particular alloy. In the aluminum-copper alloy containing 4 per cent copper, the copper combines with part of

Table 1. Typical Mechanical Properties of Some of the Heat-Treatable Aluminum Alloys

Alloy and Temper*	Tensile Strength, Pounds per Square Inch	Yield Strength, Pounds per Square Inch	Elongation in 2 Inches, Per Cent†	Brinell Hardness, 500-kg. Load 10-mm. Ball
17SO‡	26,000	10,000	20	45
17ST‡	58,000	35,000	20	100
25SO	26,000	10,000	20	45
25SW	48,000	25,000	18	80
25ST	58,000	35,000	20	100
51SO	16,000	5,500	30	28
51SW	35,000	20,000	24	64
51ST	48,000	38,000	14	95
195-T4	31,000	16,000	6	65
195-T6	36,000	22,000	3	85
195-T62	40,000	27,000	0	95

*In the wrought alloys, 17S, 25S, and 51S, the suffix O indicates the annealed condition; W, the heat-treated and quenched condition; and T, the heat-treated, quenched, and fully aged condition. In the cast alloy, 195, the suffix T4 indicates the heat-treated and quenched condition; T6, the heat-treated, quenched, and partially aged condition; and T62, the heat-treated, quenched, and fully aged condition.

†The values given for the wrought alloys are representative of sheet. For heavier sections than the normal sheet gages, the elongations are usually higher.

‡Duralumin.

Table 2. Approximate Radii for 180-Degree Cold Bends in Strong Aluminum Alloy Sheet*

(t = thickness of sheet)

Alloy and Temper†	26 B. & S. Gage	20 B. & S. Gage	14 B. & S. Gage	8 B. & S. Gage
17SO	0	0	1/2t	t
17ST (as quenched)	1/2t	3/4t	t	1 1/2t
17ST	t	2t	2t	2t
25SO	0	0	1/2t	t
25SW	1/2t	t	1 1/2t	1 1/2t
25ST	t	2t	2t	2t
51SO	0	0	0	0
51SW	1/2t	t	1 1/2t	1 1/2t
51ST	3t	4t	5t	6t

*The values given in this table represent average shop practice for production conditions. Considerably shorter radii can be employed if special care is taken.

†The suffix O indicates the annealed condition; W, the heat-treated and quenched condition; and T, the heat-treated, quenched, and fully aged condition.

the aluminum to form the compound $CuAl_2$. As the alloy solidifies on cooling through the freezing range, a certain amount of the $CuAl_2$ is rejected to the grain boundaries in the form of a hard, brittle network of copper-rich material.

If other elements are present in the alloy, the structure surrounding the grains becomes quite complex and includes a variety of constituents, all of which are hard and brittle. In the "as-cast" state, the alloy has a heterogeneous structure, consisting principally of the aluminum-rich grains, which are more or less completely separated by the brittle network of copper-rich material. If the alloy is worked, the grains are elongated and the network broken down.

On heating either the "as-cast" or worked alloy to the heat-treating temperature, the $CuAl_2$ goes into solid solution in the aluminum-rich material; in other words, this hard, brittle constituent is taken up from the grain boundaries and dissolved in the grains to form a homogeneous material. It is held in this condition by quenching from the heat-treating temperature. The solution heat-treatment, therefore, produces a more uniform distribution of the hardening constituents in the alloy and improves its strength and hardness.

Improving and Stabilizing Physical Properties by Precipitation Heat-Treatment

The structure obtained on heat-treating is supersaturated and somewhat unstable, since there is a tendency for the soluble constituents to separate out submicroscopically on standing at room temperature. In some alloys, this precipitation of the soluble constituents is more pronounced than in others. It may take place at room temperature or at a higher temperature.

In the case of the 17S alloy (duralumin), precipitation begins immediately after the solution heat-treatment and is practically complete in about four days; alloys 25S, 51S, and 195 require a treatment at approximately 300 degrees F. for several hours to obtain the desired dispersion of the soluble constituents. This dispersion is sometimes referred to as "aging," and when it takes place at a temperature higher than room temperature, as "artificial aging."

The separation of submicroscopic particles in an aluminum alloy, or the aging of the alloy, produces a keying effect between the slip planes of the grains, which materially increases the resistance of the metal to deformation under load. The aging treatment, therefore, consists in bringing about a better particle size of the hardening constituent to provide maximum keying action. The tensile strength, yield strength, and hardness are increased, and the elongation decreased.

Obviously, the decrease in plasticity affects the workability of the material, and in some cases, the more difficult forming operations cannot be carried out on completely aged metal. Because of this condition, it is necessary, at times, to form the 17S alloy immediately after heat-treatment and before age-hardening has taken place to any appreciable extent. In the case of the other alloys, forming can be done after the solution heat-treatment and before the precipitation, or artificial aging, treatment.

It is possible to retard the age-hardening effect in the 17S alloy for at least twenty-four hours by quenching the alloy in ice water and keeping the alloy at a temperature of 32 degrees F. or less. This phenomenon is commonly made use of in aircraft factories and other metal-working industries using large quantities of 17S alloy rivets. Rivets of this alloy are usually pointed cold, and before it was found possible to retard age-hardening, they had to be driven within one-half hour after heat-treatment. With the development of a method for temporarily arresting precipitation in the alloy, it is possible to heat-treat a day's supply of rivets at one time, thus eliminating the necessity for a number of heat-treatments during the day.

Effect of Heat-Treatment on the Physical Properties of Aluminum Alloys

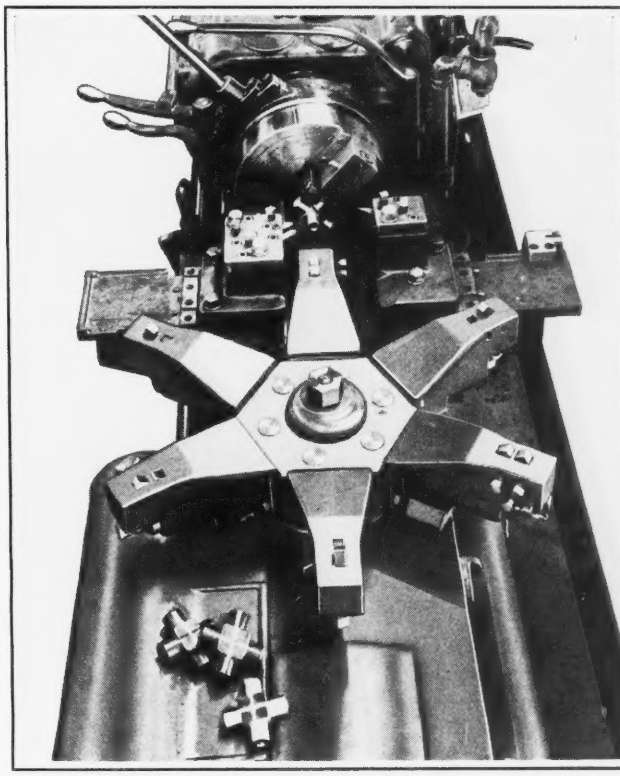
The tensile properties of some of the more common heat-treated wrought and cast aluminum alloys in the annealed, heat-treated and quenched, and heat-treated, quenched, and aged conditions are given in Table 1. The workability of the wrought aluminum alloys with various heat-treatments is indicated in Table 2, which shows the bend radii for the various tempers of these alloys. This table cannot, of course, be followed rigidly, since it is impossible to give the exact bend radii applicable to all types of forming equipment and tools. Then, too, differences in shop practices influence the radii employed. It serves, however, as an indication of the effect of heat-treatment.

* * *

How the Department of Commerce Promotes Export Business

Business valued at more than $47,000,000 was reported by United States exporters to the Bureau of Foreign and Domestic Commerce as direct results of the trade promotional activities of the Bureau, according to Frederick M. Feiker, director, in his annual report. The Bureau annually requests the firms and associations that have been served by it to report the dollars-and-cents value of business resulting from services rendered by the Bureau. The $47,000,000 worth of business mentioned represents the reports of less than 10 per cent of the business firms who obtained information from the Bureau in answer to inquiries. As examples of business obtained through information furnished by the Bureau of Foreign and Domestic Commerce may be mentioned exports of $150,000 worth of Birmingham steel products; $200,000 worth of airplanes and airplane equipment; and $152,000 worth of radios.

Air-Operated Indexing Chuck that Cuts Costs



Automatic Indexing of the Work in the Chuck by a Pneumatic Attachment Permits All Four Arms of a Differential Cross to be Machined in Less than Two Minutes Floor-to-Floor Time

By I. F. YEOMAN

WORK, such as differential and universal joint crosses, having four projecting arms spaced 90 degrees apart can be machined efficiently with the equipment shown in the heading illustration and in Fig. 3. The set-up illustrated turns, drills, faces, and necks all four arms of the part shown in Fig. 1 ready for grinding in less than two minutes, floor-to-floor time. This part is manufactured in fairly large quantities. All dimensions are held to close limits, and the arms must be spaced 90 degrees apart within extremely close limits.

The work is gripped on the central web by means of a Foster-Barker wrenchless chuck equipped with automatic indexing jaws. The jaws are indexed by means of a double-acting air cylinder attached to the rear of the machine spindle. A locking device positively locates and maintains the jaws in each indexed position. The indexing movement of the jaws is completed while the machine is in motion and is effected through the air-control mechanism shown in Fig. 2.

The two-way air-valve mechanism *A* is attached to the carriage beneath the cross-slide. Flexible pipes lead from this valve to the air cylinder. At *E* is a bracket to which a tumbler or pawl *D* is fastened. Bracket *E* is attached to the cross-slide and is adjustable lengthwise of the slide. As the cross-slide moves forward, the pawl *D* passes over the pawl *C*. Pawl *D* swings forward slightly in order to clear pawl *C*, but immediately falls back to its normal position.

When the cross-slide returns, pawl *D* engages pawl *C* and rocks it forward against the valve-stem *B*, opening the valve for indexing the work. After pawl *D* clears pawl *C*, a spring inside the valve returns the valve and pawl to their original positions. The second port opens when the valve is in this position, causing the air-operated draw-rod to be returned to its former position for the next indexing movement. This movement also closes and

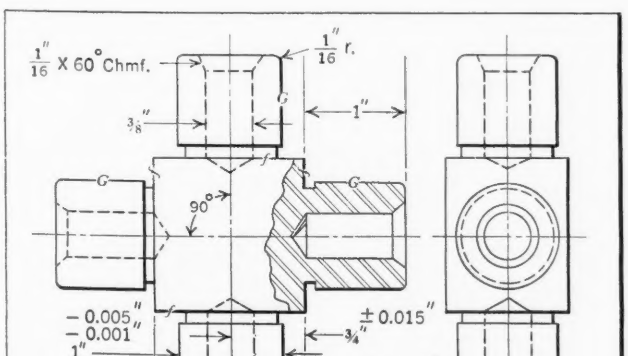


Fig. 1. Cross Machined with Tool Equipment Shown in the Heading Illustration and in Fig. 3

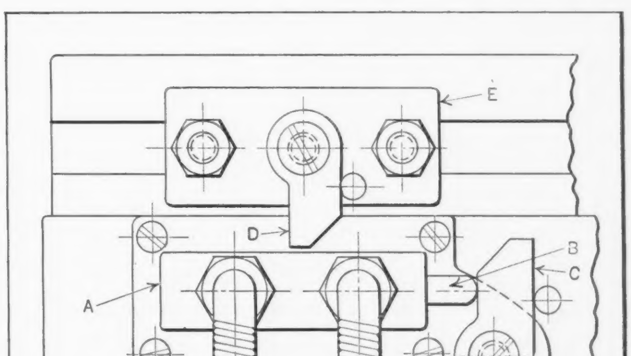


Fig. 2. Air Valve Attached to Lathe Cross-slide for Controlling Work-indexing Mechanism of Chuck

maintains the locking device in a rigid position.

While the tooling equipment illustrated is applied to a turret type Fastermatic, it may be applied to almost any type of turret lathe. The machining operations on each arm of the cross require two faces of the turret to be tooled up. Three sets of tools, in duplicate pairs, may be used in the turret, as shown in the heading illustration. This tooling equipment is also shown in Figs. 4 and 5.

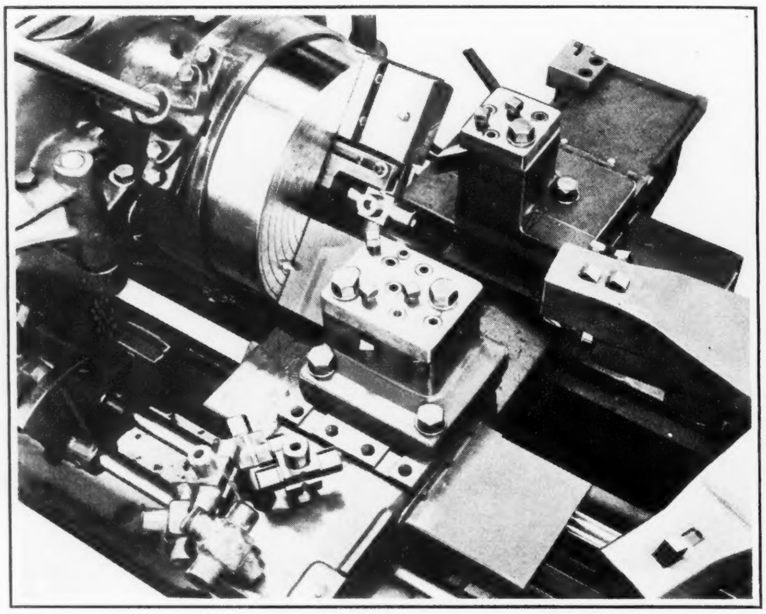


Fig. 3. Chuck that Automatically Indexes Each Arm of Cross into Position for Machining with the Tools Illustrated

The cutters in block *G* rough-face the end and web of the arm while the outside is rough-turned and the end drilled and finish-faced by the tools in the block mounted on the turret. The finishing operations are performed with the tool equipment shown in Fig. 5. These operations consist of finish-turning, forming the end to the required radius, and chamfering the drilled hole. The web is finish-faced and the neck formed by a cutter mounted on the rear cross-slide. The return movement of the cross-slide from the necking position indexes the work after the turret tools have backed away.

Foundrymen to Meet in Chicago

The American Foundrymen's Association has decided to hold its 1933 annual convention and exposition in Chicago during the week beginning June 19, with headquarters at Hotel Stevens. The following week the annual meeting and exhibit of the American Society for Testing Materials will be held in Chicago. In addition, several of the national engineering societies will hold their meetings in Chicago during the week beginning June 26. The scheduling of so many important meetings at approximately the same time will make it convenient for manufacturers and engineers who are interested to attend several of these conventions. The "Century of Progress" exposition in Chicago will open June 1, adding another reason for attending the convention. The week of June 19 has been designated by the exposition administration as "Science Week," and that of June 26 as "Engineering Week." One-day programs will deal with subjects in applied science and engineering.

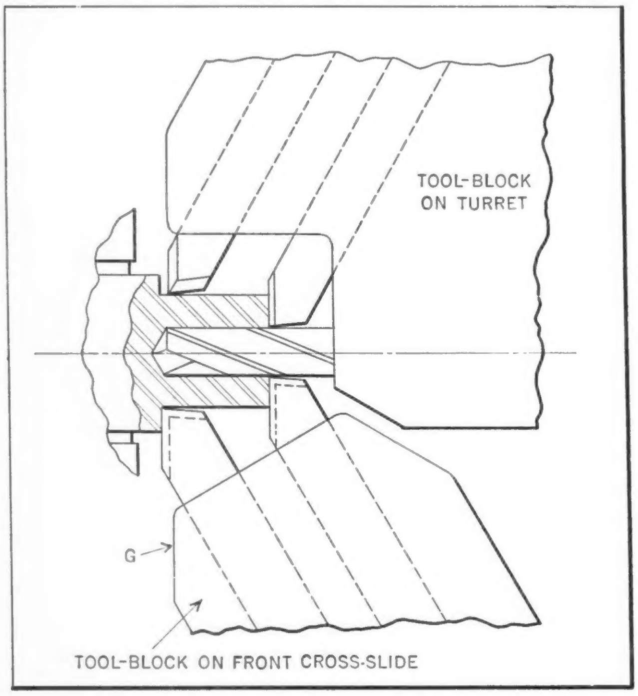


Fig. 4. Tools Used for First Operation on Cross

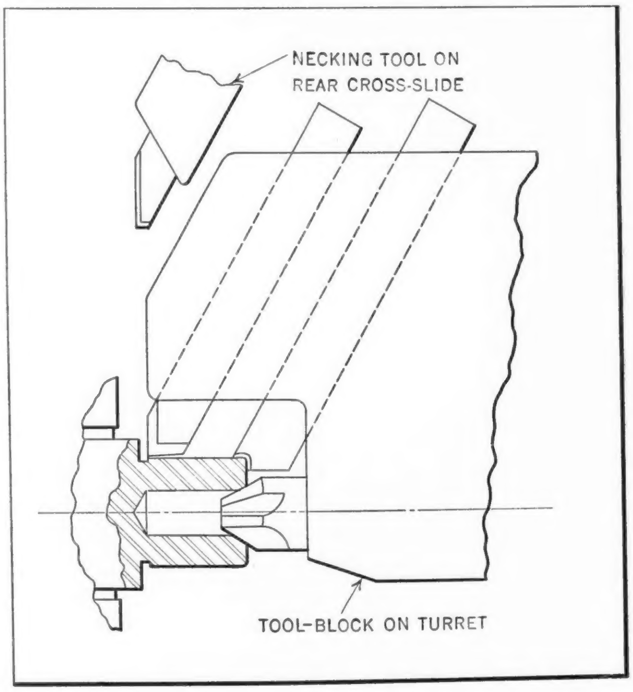


Fig. 5. Tools Employed for Second Operation

Electric Welding Has Rapidly Gained Ground In Industry

Equipping for the New Needs of Industry
Section 15

IN few branches of the engineering field has more rapid progress been made than in the application of the methods and processes of electric welding. Only a few years ago, this new process was looked upon askance by many engineers. Today, it is accepted for almost every purpose where metals that can be welded are to be joined. The constant aim of the manufacturer and user of welding equipment has been to increase the quality of the weld, obtain greater welding speeds, and reduce production costs.

New developments in electric welding are being announced almost daily. A submarine with a welded hull launched in a Navy Yard, a steel home erected by arc welding, a thousand-mile pipe line, a welded boiler—these are only a few of the less common achievements.

Definite Standards for Electric Welds and Welding Equipment have been Established

Several engineering associations have devoted a great deal of effort to obtaining facts relating to welding processes and to establishing standards for the guidance of those who use them. Two of the more noteworthy examples of this work are "The Report of the Structural Steel Committee of the American Bureau of Welding" and the "Code" of the American Society of Mechanical Engineers, setting forth the conditions under which fusion welding may be used in the manufacture of fired and unfired pressure vessels.

Almost immediately this "Code" became the standard by which fusion welding is judged. It serves not only as a guide for the manufacturer of welded products, but also for the manufacturer of welding equipment and electrodes.

The Structural Steel Welding Committee's report provides a reliable background on which the structural designing engineer can base his calculations. In publishing this report, the American Welding Society has put the stamp of its approval on the fusion welding of structural steel buildings. It is the result of a vast number of tests conducted in thirty-six different manufacturing plants in the United States and Canada. Shortly after its publication, the American Institute of Steel Construction formally recognized the several fusion welding processes.

For many years, there has been a lack of definite standards for welding equipment, but the American Standards Association will shortly publish standards on both resistance and arc welding equipment. The Resistance Welders Manufacturers' Association has just adopted a "Standard Specification" for resistance welding transformers.

The development of equipment and welding electrodes has kept pace with the evolution of the art. Generators designed to supply the exacting requirements of improved types of electrodes have recently been made available.

Physical Characteristics of Welds Now Equal Those of High-Grade Steel Plate

Welds can now be made having physical characteristics equal or superior to those of high-grade steel plate. Tensile strengths up to 75,000 pounds per square inch and ductility values exceeding the plate itself can be made regularly and with entire confidence. Some manufacturers of pressure vessels are welding plates 5 inches thick in fabricating vessels to be used at tremendous pressures and at high temperatures.

The success of these welds lies in the heavily coated electrodes and special technique of welding. Harmful oxides and nitrides that occur in the so-called "bare electrode" welds and that are caused by contact of the molten metal with the air are eliminated by an envelope of protective gases formed by the combustion of the heavy coating. The formation of this gaseous shield and the deposition of a layer of slag on the surface of the weld, which retards the cooling rate and improves the quality of the weld metal, are essential qualities of a high-grade heavily coated electrode.

The feeding of these heavily coated electrodes continuously from a reel by means of an automatic welding head has been successfully accomplished. To the high quality of weld metal obtained from this type of electrode are added the many desirable features of machine welding, such as automatic control of the arc and freedom from possible defective spots in the weld, which often occur when electrodes are changed, as in hand-welding.

Until lately, the use of arc welding in the fabrication of pressure vessels was not permitted by either the insurance codes or the laws of many states.

This restriction was due to the uncertain quality of welds during the early development of the process. The "shielded-arc" process, however, has been one of the steps that has made it possible to produce, economically, welds having a tensile strength of from 60,000 to 75,000 pounds per square inch and a ductility at least equal to that of rolled steel. This has removed the barrier that prevented the use of the electric arc in the fabrication of pressure vessels.

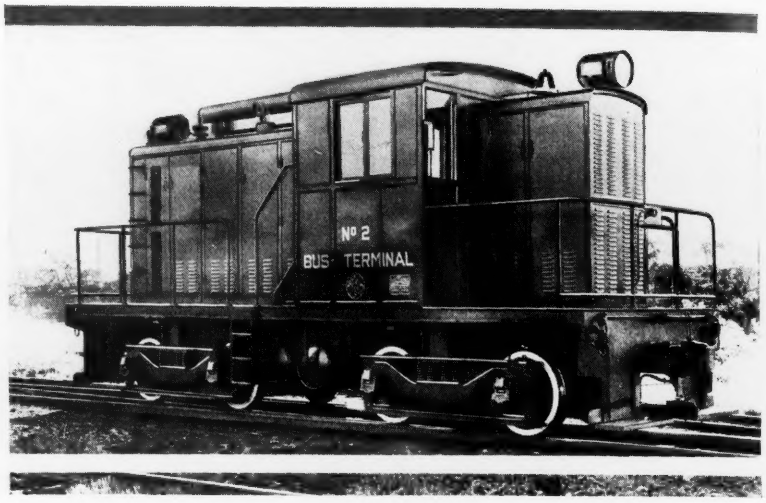


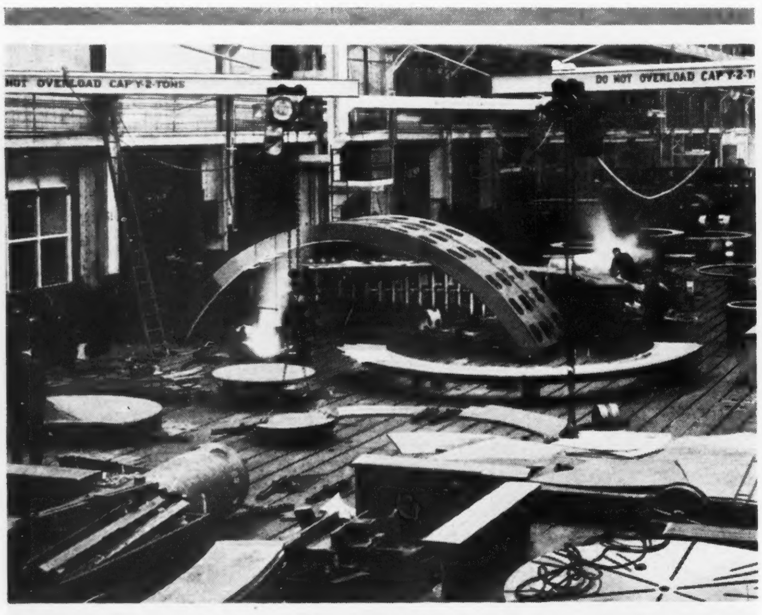
Fig. 2. Oil-electric Locomotive of All-welded Construction Built by the General Electric Co.

In building special machine tools, the expense for patterns is usually high. Hence, beds and frames for such machines are more and more generally being constructed from steel sections welded together. When this fabricated construction is used, patterns need not be considered, and a saving is made both in expense and in the time of delivery.

By using the arc-welding method, it has, for example, been possible to construct and deliver the bed and table of a 14-foot gang drilling machine within ten days. If a cast construction had been employed and no patterns were available, it would have required at least thirty days to carry this work through.

When the pattern cost is absorbed by a large number of machines, it is often desirable to use cast iron. The selection of the material must depend entirely upon the circumstances. In cases where it is desirable that parts of a structure be of cast iron, castings are being welded to the steel frames. For example, synchronous motors in the larger sizes are provided with frames, rotors, and bedplates of welded construction, while the bearing pedestal is made from cast iron. Parts having cored passages may be cast and then welded to the steel frame.

Fig. 1. View in the Westinghouse Electric & Mfg. Co.'s Welding Shop at East Pittsburgh. This Shop is 400 Feet Long by 75 Feet Wide



The frames of various types of power presses are made entirely of rolled-steel plate. The plates are cut to size and shape by the acetylene torch and are then arc-welded. The frame, ram, and gears are all constructed in this manner. Welded steel construction has also been adopted in a line of bulldozers recently developed.

Welding is employed regularly for unusually large machine frames. On the five 77,500-K.V.A. hydro-electric generators manufactured for the Dnieper River power development in Soviet Russia, fabricated welded construction is used for all the large frames and parts. The total weight of each generator is 880 tons.

As an example of time saved by welded construction may be mentioned the making of the frame for a 5000-horsepower mill-type motor. Although the material for welding this frame was not in stock, the manufacturer was able to complete the frame, ready for machining, in thirty days after the drawings were finished. The time required to make the pattern for a casting would have been nearly the same as the time required for making the entire fabricated structure.

Another spectacular application of the welding art is in the construction of steel-frame buildings. These may be welded either by the gas torch or by the

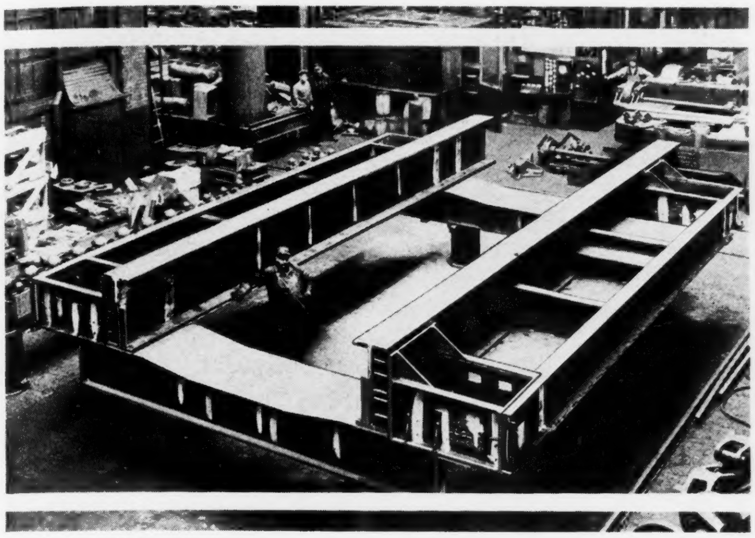


Fig. 3. Base of Charging Machine Welded by Wellman Engineering Co. (Courtesy of Lincoln Electric Co.)

electric arc. The largest structure thus far welded with the gas torch is a research laboratory 75 feet wide, 260 feet long, and 42 feet high at Niagara Falls. The tallest arc-welded structure is a 19-story office building erected in Dallas, Texas. In the last few years several hundred steel structures have been totally or partially welded, with no record of failures in the welded joints.

Welded steel gears ranging from 15 inches to 14 feet in diameter can now be obtained. While similar in appearance to cast-steel gears, they are said to give 30 to 50 per cent longer life and to have approximately 50 per cent greater tensile strength. Recently a rolled-steel blank having a diameter of 5 1/2 feet, a face width of 12 inches, and weighing 4350 pounds was constructed by welding. The rim thickness of this gear blank was 4 1/8 inches and the hub diameter 22 1/2 inches.

The application of the electric welding process to pulleys has also made noteworthy advance. Light weight, combined with great strength, is obtained in this manner. One pulley manufacturer produces 400 welded pulleys a day, ranging in size from 3 inches to 6 feet in diameter. The ease with which the process can be adjusted to varying requirements is evidenced by the fact that 300 different types and sizes of pulleys are manufactured on a production basis in this plant.

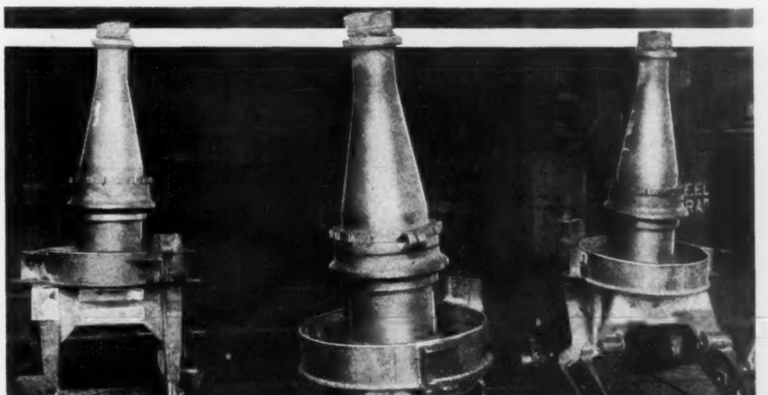
One large plant produces 400 welded jigs a month by the arc-welding process. In fact, all the jigs, fixtures, and special equipment in this plant are produced by this method. An arc-welded jig body or the frame of a machine can be delivered to the machining department in about the same time that it would take to make a pattern for casting the same part.

The cost of welded jigs and fixtures, as compared with the cost of making the same parts from castings, has been thoroughly investigated. Welded structures are found to be about 25 per cent less expensive. In many cases, the cost of the jig body or machine base is about the same as the cost of a pattern.

The methods of machining jigs and fixtures of this type do not differ from those used in machining cast jigs, except that less material is removed. The machining time is reduced about 10 per cent.

Electric welding has come into wide use in the automotive industry and has made it possible to use steel stampings in place of heavy castings for many important parts. In one plant, an automatic machine is used for welding together the two steel stampings that form an axle housing. The entire process, which consists of welding four seams of 20 inches each, is completed in less than two minutes. The loading and turning over of the housing takes less than one minute, so that a machine turns out approximately 25 housings an hour. As these machines are fully automatic, a production of 50 to 55 housings an hour is obtained from two

Fig. 4. Welded-top Nickel-steel Gun Carriage Indicates Reliability of Arc-welding (Courtesy of Lincoln Electric Co.)



machines operated by one man. The strength and ductility of the weld is such that the housing can be twisted into all sorts of shapes without breaking, and the welds are readily machined. The housings are held to uniform length within 0.001 inch.

Another most remarkable application of welding is the all-welded bodies of passenger automobiles. The entire side of the body of a car is stamped from a single sheet, with the openings die-formed for reinforcement. Then flash-welding is employed to join sheets as large as 10 feet long. The tonneau rear seams are flash-welded as shown in Fig. 5. This line weld is a difficult one to make, as the steel is only 0.037 inch thick and the line is a compound curve. The cowl and roof are attached to the side sheets by spot-welding. The flash-welding of the larger sheets requires unusually accurate alignment, which is secured by a scarfing operation that trims both edges of the sheet at the same time.

The use of the right kind of electrodes is important. Most of the electrodes used are of copper or an alloy containing a large percentage of copper. To secure long life, the electrodes are cooled to within 1/2 inch of their points, whenever possible. In a sedan body, there are 2300 spot-welds and 140 inches of flash-welding.

The special arc-welding processes, such as the carbon arc, shielded arc, and atomic hydrogen arc, have been improved in many ways. In the case of the atomic hydrogen process, an automatic machine has been devised to strike the arc, feed the electrodes, and move the arc along the weld. Speeds hitherto unheard of, combined with the extremely high grade metal of this process, are reducing costs and making possible fabrication that could not be accomplished by any other process.

In resistance welding, such as spot, seam, flash, and projection welding, speed and quantity production have been relatively easy of attainment. There is a growing appreciation of the fact that not only can these welds be made at high speed, but they must be made quickly in order to get good welds without injury to the exposed surfaces. This is particularly true in welding stainless steel. It is found that the best results are obtained by providing just the proper amount of

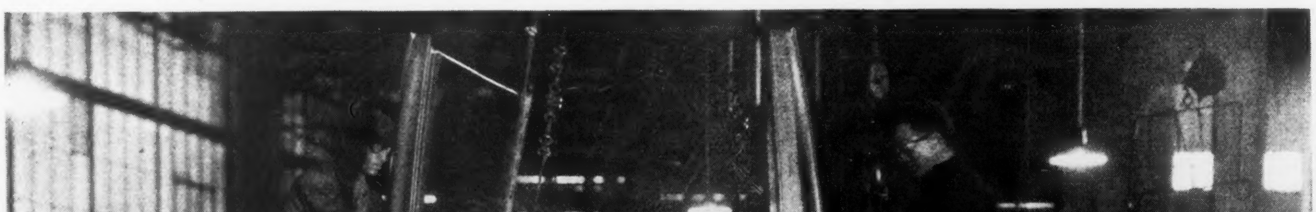


Fig. 5. Flash-welding the Two Sides to the Back Panel of a One-piece Automobile Body at the Plant of the Edw. G. Budd Mfg. Co.

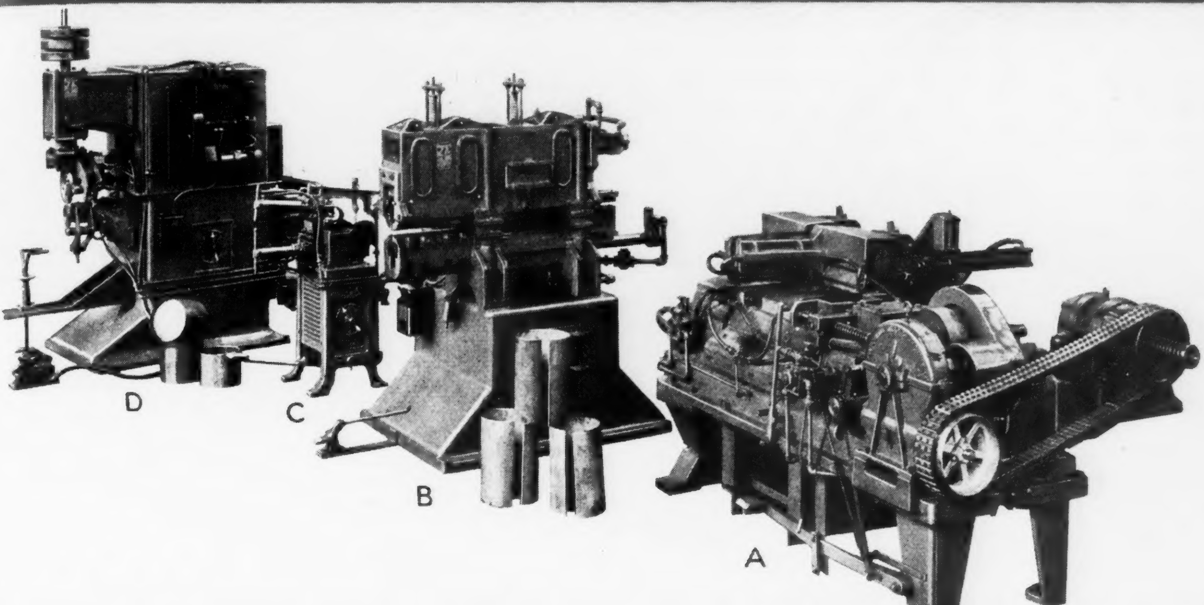


Fig. 6. Battery of Federal Machine & Welder Co.'s Machines Used in the Production of Metal Pails and Containers

current for each weld to permit the weld to be made in such a short space of time that the heat does not have a chance to be conducted to the exposed surfaces. Such conduction is often not allowable, as it affects not only the appearance of the surface, but its corrosion resisting ability as well.

New Controlling Devices for Spot- and Seam-Welding Speed up Work and Improve Quality of Welds

In spot- and seam-welding, great welding speeds and improved quality have resulted from the introduction of such devices as the thyratron control, the synchronous interrupter, and various combinations of electrical and mechanical interrupters or switches for metering out sufficient current to make the desired weld. In seam-welding, such devices as the thyratron and the synchronous interrupter, for example, are used for breaking the current cleanly at desired intervals, since it has been found that the resulting surge of current across the weld will give better welds without interfering with the production of a continuous seam.

There has been a general increase in the size of sections being welded; automobile sheets 120 inches wide are being flash-welded together; 26-inch diameter steel pipe is being resistance-welded at high speed; projection welding at high speed has come into use for the fabricating of steel railway ties, automobile hubs, and brake-bands.

Equipment for Welding Pails and Containers

A battery of electrical resistance-welding machines set up for the rapid production of heavy sheet-metal containers and pails is shown in Fig. 6. This battery consists of four distinct units. The first operation in producing a pail or container is performed on the side-seam flash-welding machine shown at *A*. This machine is capable of welding from 250 to 300 side seams an hour.

The hydraulic flash-stripping machine shown at *B* is provided with a hydraulic system for clamping the work. This machine removes the flash down flush with the parent metal. The third machine, shown at *C*, consists of a spot-welder for welding in the bottoms of pails and containers preparatory to seaming. The machine at *D*, which is a roller seam-welder with special thyratron interrupter, performs the final operation of seam-welding the bottoms to the pail or container bodies.

Electric Welding and Forging in One Operation Has Many Possible Applications

The possibilities of "mash" welding, or combined welding and forging, are being further appreciated, and applications of this process have been made in the manufacture of heavy grating, where a large number of welds are made and forged in one operation.

Resistance-welding machines may, in fact, be substituted for standard forging machines in many cases. Collars of various sizes can be upset on shafts or studs, and bolts can be headed this way. It has been found on some types of forge work that the part can be heated by electrical resistance at 15 per cent of the cost of heating in a furnace.

One firm building electric locomotives uses this

type of machine for heating pipe and forming bends. The machine is extremely rapid, heating pipe from 1 to 3 inches in diameter in from three to eight seconds. The bending of structural shapes in fabricating shops is also being done extensively on these machines.

Localized annealing can be carried out successfully in jig, fixture, and die work when the article must be annealed in certain local spots or areas to resist shock or to prepare it for later machining operations.

Heating for hardening can also be done successfully and economically in these machines. The uniformity of temperature obtained in each piece is quite remarkable.

Automatic Arc Welding Facilitates the Production of Tanks and Steel Cylinders

One of the most important steps in the development of arc welding has been in the application of automatic welding equipment. Automatic arc welding heads can be arranged to reproduce a weld any number of times without readjusting after the initial setting has been made.

The welding head automatically strikes the arc and then maintains the required arc voltage, feeding the electrode into the arc from a 100- or 200-pound reel of wire and moving the arc along the weld. The head is readily adaptable to any type of welding, including butt welding, fillet welding, or building-up processes. Machines have been built for handling work up to 30 feet in length.

Automatic arc welding machines have been developed recently to facilitate rapid production of range boilers and small tanks. One type of these machines is designed for welding longitudinal seams and another for welding circular seams. Tanks from 11 to 33 inches in diameter and up to 6 feet in length can be handled with this equipment.

One of the spectacular developments of semi-automatic electric arc welding is found in its application to the welding of tanks 10 feet in diameter and 16 feet in length. Tanks of this size are now being welded to withstand pressures of hot oil up to 300 pounds per square inch. Semi-automatic welding machines weld both the longitudinal and the circumferential seams without the tanks being removed from the machine.

In an automatic welder for automatic starter frames, the rolled steel cylinders of which the frames are made are fed into position by means of a gravity conveyor. No filler rod is used, as the two edges of the seams are fused together. The machine has a capacity for welding approximately 240 frames an hour, and one man and a helper can operate four machines simultaneously. Under average operating conditions, the cost of welding the frames is approximately one-half cent each.

Joints of Low-Carbon Steel Joined by Butt-Welding under Hydraulic Pressure

While arc welding has presented some of the most spectacular applications in electric welding, there have been some remarkable advances in butt-welding and other forms of electric welding as well. In one butt-welding operation, joints having a cross-section of 18 square inches are forced together under a suddenly applied hydraulic pressure of 100,000 pounds to insure a homogeneous weld. The material welded is low-carbon steel.

An Electrical Brazing Process that Produces Strong, Neat Joints

Metal joints of great strength and unusual neatness, such as are required for joining the ends of band saws, are produced rapidly by the electrical brazing process. This process can be applied to nearly every form of metal in common use, including copper, nickel, silver, steel, and other alloys.

The equipment used for this work is of the portable type, and consists chiefly of a transformer, hand-brazing tongs, brazing alloy, and a foot-operated floor switch. In some respects, the process resembles that of electric spot-welding, the parts to be joined being clamped rigidly between a pair of carbon electrodes, after which an electric current is passed through both the electrodes and the joint.

Improved Methods of Testing Welds

Two improved methods have been developed for detecting faulty welds by magnetic equipment. This is done with surprising accuracy and without injury to the members being tested. One of these is known as "magnetographic inspection," and is the method most sensitive to poor fusion, cracks, or other faults that extend to or near the surface. A permanent record of this test is obtainable.

The other method, known as the "weld test meter method," will locate faults at practically any depth below the surface. It is less dependent on the experience and judgment of the user, and can be effectively employed for comparing welds made in the same kind of steel. Readings are taken directly from the dial of the meter.

Improved Cutting-off Equipment for the Up-to-Date Shop

Equipping for the New Needs of Industry
Section 16

MACHINES and equipment for cutting off bar stock and for performing various other metal-cutting operations have undergone considerable improvement within the last few years. In some cases, entirely new methods and equipment have been adopted.

The development of numerous alloy steels that could not be efficiently cut with the older types of hacksaw blades, for example, has prompted many improvements, both in the materials from which hacksaws are made and in the methods of manufacture. Among the improvements may be mentioned molybdenum-steel hacksaw blades, which have given remarkable results. In a large street railway shop, 90-pound rails were cut off in an average time of 9 minutes 10 seconds per cut for twelve consecutive cuts. In another case, 3/4-inch hexagon tool steel was cut off in 15 seconds for the first cut, and 20 seconds for the second.

A new type of hacksaw blade is now available, which is provided with 2 1/2 to 3 inches of fine teeth at the forward end of the blade to facilitate starting the cut. This blade is made in hand frame sizes, with 14 to 18 teeth to the inch, and is obtainable in different steels to suit various requirements.

Metal-Sawing Machine with Automatic Features

Many improvements have been made in metal-sawing machines using hacksaws as the sawing medium. In recent designs of this type, changes in feeding pressure are made with the aid of a graduated scale and a dial which indicates the amount of pressure, in pounds, applied to the saw blade. Automatically released clutches are provided, so that when the cutting operation is finished, the drive is disengaged and the saw frame raised from the work. The saw blade, of course, is lifted automatically on the non-cutting stroke to prevent it from dragging on the work. Standard machines are provided with two operating speeds adaptable for either tool steel or machine steel. One type, for example, can be set to make either 90 or 140 strokes per minute.

A vertically reciprocating saw blade is employed in one 14- by 16-inch heavy-duty metal-sawing

Fig. 1. Hunter Saw & Machine Co.'s Metal Cutting-off Machine Equipped for Cutting off Bar Stock, Tubing and Structural Steel Shapes

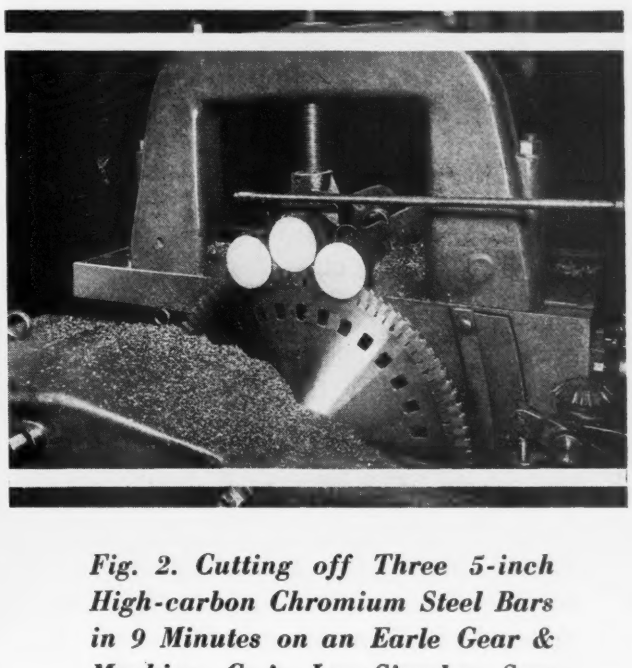


Fig. 2. Cutting off Three 5-inch High-carbon Chromium Steel Bars in 9 Minutes on an Earle Gear & Machine Co.'s Lee-Simplex Saw

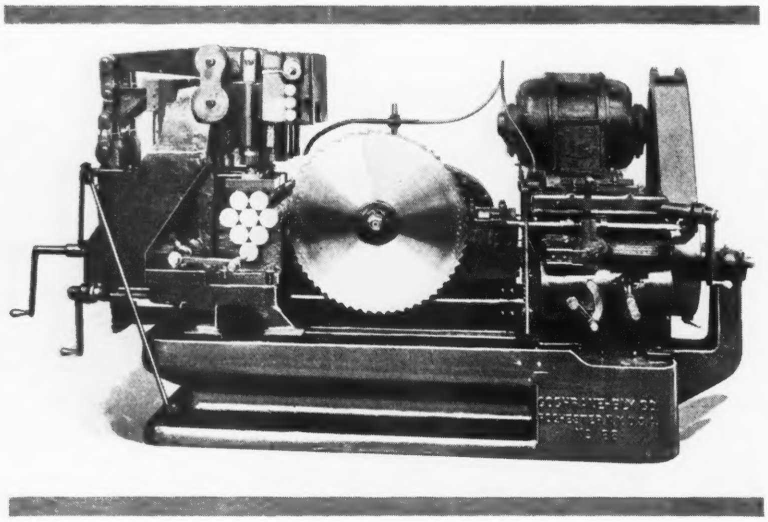


Fig. 3. Cutting off Eight 3-inch Round Bars in 2 1/2 Minutes on a Cochrane-Bly Metal-sawing Machine Having Duplex Compound Toggle Air Clamp. Same Equipment Cuts off 559 Rods, 1/4 Inch in Diameter, in 2 1/2 Minutes

machine. This machine is motor-driven, and is intended for cutting large bars and billets. The vertical operation of the blade permits work to be placed on the table of the machine by an electric crane or other means. The vertical position of the blade also enables a heavy stream of cooling solution to be applied at the top of the cut, which greatly assists in forcing out the chips at the bottom. A safety feature prevents the blade from breaking when it becomes dull. Three operating speeds are provided.

Two Tool-Slides and Hydraulic Feed are Features of Fast Cutting-Off Machine

Increased production and quicker set-up through the provision of a hydraulic feed, double slides, wider speed range, accessibility, and easy adjustment are the advantages claimed for a hydraulic cutting-off machine developed recently. This machine is built in two sizes, of 3 and 4 1/2 inches capacity.

Feeds from 0.001 to 0.040 inch per spindle revolution varying by increments of ten-thousandths inch are obtainable instantly by turning a graduated dial. Two tool-slides, one at the front and one at the rear, equipped with cutting blades that are used simultaneously, reduce the cutting time to half of that required on a single-slide machine. One slide can be used for chamfering while the other is being used for cutting off.

Friction saws are being used to an ever increasing extent for speeding up production and reducing manufacturing costs. One application of these saws is for removing risers from steel castings. Hub risers on sprocket wheels and pulleys, for example, are removed by this means in less than fifteen seconds actual cutting time, the floor-to-floor time being about thirty seconds.

Abrasive cutting-off wheels are being increasingly used for cutting off bar stock and tubing at very high speed. On a modern type of cutting-off machine, for example, an abrasive cutting-off wheel will cut off steel rods 1 1/8 inches in diameter in from 1 1/2 to 2 seconds, leaving a clean, smooth cut. These wheels can be run at peripheral speeds up to 16,000 feet per minute. They are made in thicknesses of from 1/16 to 1/8 inch.

Solid bars up to 2 inches in diameter can now be cut off by means of a 16-inch abrasive wheel which can be applied to a cut-off machine of standard make, the wheel merely replacing the saw.

The electric-arc cutting saw is a recent development having considerable possibilities. Metal bars, shapes, and similar parts can be cut by means of a rapidly rotating disk wheel through which a current of electricity flows. Among the materials used for the wheel are carbon and different forms of abrasives. The wheel forms one electrode, and the work to be cut the other.

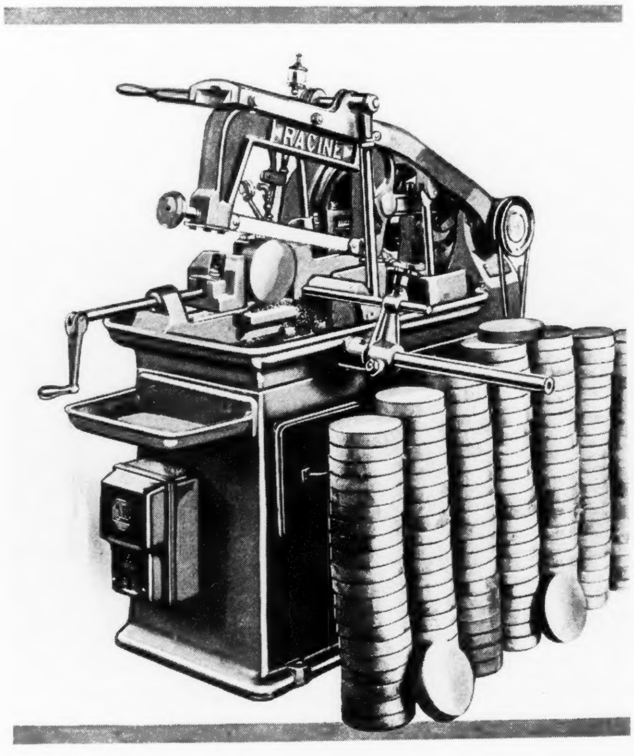


Fig. 4. Racine Tool & Machine Co.'s Shear-cut Production Saw and Block of 176 Alloy-steel Pieces, 5 Inches in Diameter, which were Cut from Bar Stock with One Blade at the Rate of 4 Minutes 5 Seconds per Cut

Improvements in Iron and Steel Meet the Designer's Needs

Equipping for the New Needs of Industry
Section 17

MUCH has been learned about iron and steel materials within the last few years. Their heat-treatment has developed into a more definite and generally applicable science, with a substantial broadening of the range of physical properties. Vastly superior steels and castings have been developed to meet the requirements of a great variety of applications by alloying these materials with other elements. Remarkable progress has also been made in the standardization of iron and steel materials, as well as in their heat-treatment. These developments have greatly simplified many problems in machine design and resulted in engineering achievements heretofore believed impossible.

Stainless Steel with Free Machining Qualities

The development of a stainless steel that is easy to machine marks one of the important advances in the field of materials. The high-chromium stainless steel alloys first produced were extremely difficult to machine, and grinding and polishing operations were also difficult and expensive. By producing this steel with a high sulphur content or by the addition of selenium, free machining qualities can be obtained.

Such stainless steels contain approximately 0.10 per cent carbon, 18 per cent chromium, 8 per cent nickel, and 0.30 per cent sulphur (or 0.25 per cent selenium instead of sulphur). They can be machined in automatic screw machines with regular tools at speeds equal to, or closely approximating, those used for ordinary Bessemer screw stock. These materials can also be easily drilled, tapped, and threaded with dies. Wire and tubing can be cold-drawn by simply using the lime coat and lubricants regularly employed for drawing ordinary steel.

As an example of the machineability of high-sulphur or selenium stainless steel, the following case may be cited: In a nut-tapping machine, it was found impossible to tap the non free cutting nickel-chromium steel. The free cutting steel was tapped at the rate of 2.5 seconds per nut, the tap being an ordinary carbon-steel tool. In drilling 1/4-inch holes, it was found possible to drill the free machining stainless steel 1 1/16 inches deep in 28 seconds. The non free cutting grade ruined the drill at a depth of 3/8 inch after 20 seconds of cutting.

The corrosion resistance of these high-sulphur or selenium free cutting stainless steels is about the same as of the low-sulphur type. At the present time, it is general practice to use the non free machining types for parts that are brought to shape by bending, forming, or drawing, and to use the free machining grades for parts that are to be machined.

Characteristics of 18-8 Stainless Steel

The chrome-nickel stainless steel known as 18-8 is made to have a tensile strength of from 90,000 to 100,000 pounds per square inch in the annealed state. The elongation varies from 60 to 70 per cent. Cold-working will increase the tensile strength to from 120,000 to 125,000 pounds per square inch. The shearing, punching, and machining of steel of this kind requires adherence to certain predetermined methods, but when these are followed, no difficulty is experienced in performing the ordinary shop processes.

Mild Steel Sheet with Veneer of Stainless Steel

A composite steel with a stainless surface known as "Plykrome" has recently been developed. This metal consists of a veneer of stainless steel which is "weld-bonded" to a slab of mild steel and then rolled in a mill into an integral plate or sheet. The stainless alloy component may consist of any of the well-known stainless steels. The composite metal can be made with the stainless ply on one or on both sides. This metal can be bent, drawn, spun, or flanged without cracking and without causing the stainless steel and the mild steel to separate. Plykrome was exposed in a gas-fired furnace to a temperature of 1600 degrees F. for a period of weeks, alternately heating and cooling, and it was found that this severe test did not affect the bond between the two metals.

A New Two-Ply Stainless Steel

A two-ply stainless steel known as "Ingoclad" is another recent development, which is the result of many years of research. This stainless steel, with a carbon steel backing, is being produced from a composite ingot. The price of the new product is

much less than the price of solid stainless steel, so that it will be possible to make use of the stainless-surfaced steel in many instances where formerly stainless steel could not be used on account of its cost. It is stated that this two-ply stainless steel can be deep-drawn, stamped, welded, formed, and polished. It is produced in numerous gages and sizes.

Advantages of Nitrided Steel

The process of nitriding has made tremendous strides within a comparatively short time. This process is remarkable for its simplicity. Briefly, the parts to be hardened are placed in a heated furnace, subjected to the action of ammonia gas for a definite time, and then removed. The articles, as they come from the furnace, are hard and require no further treatment.

The temperature used for nitriding is low, compared with that of other heat-treating processes. The method leaves a clean surface, free from scale. The low temperature required minimizes warpage and the hardness of the case is quite remarkable.

Nitrided articles also show greater resistance to corrosion than steel generally. While nitriding does not solve the problem of corrosion, it minimizes this difficulty in many instances. A series of alloy steels containing varying amounts of carbon, together with small percentages of aluminum, chromium, and molybdenum, are now being manufactured for nitriding purposes.

Nickel-Steel Alloy for Watch and Instrument Parts

A nickel-steel alloy known as "Elinvar," which was invented and developed by Dr. Guillaume, who received the 1920 Nobel award in physics for his achievements in the perfection of alloys, has found important uses in industry. Elinvar cannot be permanently magnetized; hence it lends itself for use in instruments where magnetization may be objectionable. In watches, the balance wheel may be made from this non-magnetic metal. Furthermore, the elasticity of this alloy remains constant, irrespective of temperature variations. This makes it applicable for hair springs in watches, and it can also be applied to any kind of precision instruments requiring a hair spring or a part that is not affected by temperature variations.

Carbon-Steel Castings with Improved Physical Properties

In few branches of industry has the advance been so marked during the last few years as in the making of steel castings. Recent improvements in the methods of producing steel castings have greatly increased their strength and reliability, so that today, properly made steel castings can be applied to any service where dependability is a factor. This is remarkable, in view of the fact that not so many years ago steel castings were looked upon as a necessary evil.

Good carbon-steel castings with a carbon content not exceeding 0.35 per cent will have a tensile strength of from 70,000 to 85,000 pounds per square inch, a yield point of from 40,000 to 55,000 pounds per square inch, an elongation in 2 inches up to 25 per cent, a reduction of area up to 45 per cent, and a Brinell hardness varying from 130 to 180.

Many designers do not realize how dependable steel castings can be made or what physical properties they can be given. For example, the average physical properties of 0.27 per cent plain carbon-steel castings made in a fairly typical midwestern foundry over a period of six months were: Tensile strength, 73,700 pounds per square inch; yield point, 41,400 pounds per square inch; elongation, 27.5 per cent; reduction of area, 39.5 per cent.

High-Strength Alloy Steel Castings

A nickel-alloy cast steel with much improved physical properties and fair machineability is used extensively today for structural parts requiring great strength. An example of the properties of this type of steel casting follows: Tensile strength, 144,000 pounds per square inch; yield point, 126,000 pounds per square inch; elongation, 14.5 per cent; reduction of area, 37.5 per cent; Brinell hardness, 300.

Steel castings with such properties could not be produced even five years ago. The figures show the great strides that have been made in this field of engineering endeavor.

An interesting development in the use of cast steel is found in the heavy brace used to tie the spindle to the over-arm in a milling machine intended primarily for use with tungsten-carbide milling cutters. A steel casting was chosen in this case in order to provide a strong, stiff support.

A ferrous metal developed with the idea of combining the simplicity and adaptability of a casting with the strength and reliability of a forging is known as "Z-metal." This metal has been successfully applied for many purposes. Castings made from it have a smooth surface, and only a small amount of stock need be allowed for finishing. Sections as thin as 1/8 inch can be cast when this metal is used. The castings are easily machined; yet, if necessary, a hardness in excess of 500 Brinell is obtainable.

Steel Castings Revolutionize Locomotive Construction

Probably the most outstanding advance during recent years in the construction of steam locomotives has been the development of steel bed castings of the integral type. These locomotive "backbones" combine in a single casting the cylinders, slide-valve chambers, side frames, cross-braces, brake-hanger

lugs, smokebox support, firebox cradle, valve-motion brackets, and, in fact, practically everything but the boiler and the running gear. Hundreds of machined bolts and nuts required for attaching the separate parts in the built-up locomotive frame construction are eliminated. These bed castings provide a foundation of maximum strength and minimum weight.

The mechanical advantages obtained with these bed castings also result in large savings in repair costs. Bed castings have been produced in lengths of more than 60 feet and in weights up to approximately 40 tons.

Driving-wheel centers for locomotive wheels, for which forgings were formerly used, can now be made of a special alloy cast steel having a minimum tensile strength of 90,000 pounds per square inch; a yield point of 60,000 pounds per square inch; an elongation in 2 inches of 25 per cent; and a reduction of area of 50 per cent.

High-Strength Castings Obtained by Proper Alloying

By alloying cast iron with chromium, nickel, and molybdenum, it has been found possible to increase the strength of cast iron to from 28,000 to 45,000 pounds per square inch, although alloy cast irons with a strength as high as 65,000 pounds per square inch have been produced. Much depends not only on the alloys, but also on the melting processes. The thickness of section has also an influence on the homogeneity and strength of the metal.

These so-called "high-strength" cast irons, which are alloyed with other metals, are becoming more and more generally used. In addition to greater strength, they also have generally about 50 per cent greater hardness.

Many of these high-strength cast irons are known by trade names. One of these trade-named products, as cast, has an ultimate strength of about 45,000 pounds per square inch; but by heat-treatment, this ultimate strength can be increased to 90,000 pounds per square inch.

A nickel-chromium cast iron containing about from 2 to 2.5 per cent nickel and 0.2 to 0.3 per cent chromium, for example, shows a tensile strength of from 40,000 to 50,000 pounds per square inch. A Brinell hardness of 240 is obtainable.

Heat-Resisting Cast Iron Used for Aluminum Melting Pots

There is a considerable demand for iron that will withstand temperatures such as those to which babbitt and aluminum melting pots, and pots for lead and salt baths, are subjected. A nickel-copper-chromium iron having high heat-resisting qualities is composed approximately of 3 per cent carbon, 1.50 per cent silicon, 14 per cent nickel, 6 per cent copper, and 2.5 per cent chromium. This metal is also useful in power plants for stoker links and for furnace castings. It possesses high acid-resisting qualities.

New Method of Producing Gray Iron Castings in Permanent Molds Has Many Advantages

Successful methods have been developed for making gray iron castings in permanent molds. The most economical method is to produce the molds from regular cast iron—in other words, the mold is made from the same iron that is used for the castings. After the mold is machined, it is faced with a refractory lining which is applied in liquid form and which, when applied to a mold heated at about 300 degrees F., rapidly produces a hard baked surface which is very durable and resistant to heat.

The advantages claimed for the permanent mold casting process are:

1. The castings are uniform in size, thus simplifying inspection and jigging operations.
2. They are of uniform hardness, insuring maximum cutting speeds in machining.
3. There is a considerable saving in the machining operations, due to less frequent grinding of tools, because permanent mold castings are free from sand scale.
4. The space required to produce the same quantity of castings by the permanent mold method, as compared with ordinary sand foundry methods, is only from one-eighth to one-tenth as great.
5. When castings are made in quantity, the cost is reduced.
6. It is possible to obtain castings for inspection immediately after the casting is made; hence, defects are detected immediately.
7. There is an increase in the strength of the castings due to their uniformly close grain. This makes them suitable for high-pressure applications.

Centrifugal Method of Casting Developed for Pipe Production

The centrifugal method of making cast-iron pipe is not new, but it is only recently that it has been developed to the stage where it possesses real commercial value. In one centrifugal process of producing cast-iron pipe, a sand-lined mold is used. The molten metal is "spun" into the sand-lined mold, covering the walls while under considerable pressure due to the rotation. Pipes made by this process are now being manufactured in sizes up to 24 inches in diameter and 16 feet long.

Developments in Malleable Iron Castings

Average values of tensile strength, yield point, and elongation of malleable iron, determined from the results of upward of 20,000 tests reported by seventeen investigators, are as follows: Tensile strength, 54,000 pounds per square inch; yield point, 36,000 pounds per square inch; and elongation in 2 inches, 18 per cent.

A special-process malleable iron known as "Promal" has been developed which differs radically from ordinary malleable iron. It can be heated repeatedly to a temperature of 1000 degrees F. and cooled without affecting its physical properties. This characteristic makes the metal suitable for low-temperature heat-treating equipment, and for parts that are to be hot-dip galvanized. The physical properties are as follows: Ultimate strength, 70,000 pounds per square inch; yield point, 50,000 pounds per square inch; elongation, 10 to 14 per cent in 2 inches; Brinell hardness, 170 to 190.

Wrought iron is now being produced alloyed with nickel, copper, nickel and molybdenum, and copper and molybdenum. The development of these types of wrought iron is the result of several years of intensive research work. It is stated that alloy wrought iron, in general, has a strength 25 per cent greater than ordinary wrought iron. A great increase in fatigue-resisting properties is shown by the wrought-iron-nickel and by the wrought-iron-nickel-molybdenum alloys. The latter alloys have shown an increase in strength of from 40 to 50 per cent over ordinary wrought iron.

The Use of Malleable Iron for Machine Parts

The suitability and relative importance of malleable cast iron as a material for machine parts and structures were discussed in a paper presented before the annual meeting of the American Society of Mechanical Engineers by Enrique Touceda, consulting engineer of the Malleable Iron Research Institute. Present practice restricts malleable-iron castings to lengths not exceeding 15 feet and to sections less than 4 inches in thickness. Castings weighing but a fraction of an ounce, however, can be made from the same heat as is used for the largest sizes. The materials with which malleable iron competes, in the order of their importance, are ordinary steel castings, ordinary steel forgings, and pressed and welded parts. Gray iron castings are a competitive product only when weight, and not strength, is the dominant factor, or in cases of small or medium-sized castings where ductility is of no consequence. Malleable-iron castings, at a higher price, are also often chosen because of their smooth, even surfaces and sharp outlines.

The specifications of the American Society for Testing Materials for two grades of malleable castings indicate what properties this material may be expected to have:

Tensile strength, lbs. per sq. in. . . .	50,000	53,000
Yield point, lbs. per sq. in.	32,500	35,000
Elongation in 2 inches, per cent . . .	10	18

Malleable iron can be machined at a higher rate of speed for a given depth of cut than any other ferrous material of similar mechanical properties. The fact that malleable-iron castings are fine-grained and free from internal stresses is due to the heat-treatment that they must undergo in being converted from hard iron into a finished product. Malleable-iron castings can be cold-worked easily under punching and shearing operations. The hard iron castings are as prone to molding troubles, however, as any ferrous metal. If the casting molds are not properly fed, shrinkage will occur, which not only results in unsoundness, but in the formation of a very hard volume of metal of the dimensions of the "shrink."

While the castings can be both brazed and enameled, they cannot be welded in the sense in which that term is generally used. If given a proper heat-treatment prior to being hot-dip galvanized, they can undergo the latter treatment without having their strength markedly impaired. In the absence of the heat-treatment, however, the loss in tensile strength is generally greater than in the case of steel. While the castings can be straightened, they should not be heated for this purpose unless the temperature is kept under 1300 degrees F. They are not so adaptable for bearings as gray iron and their resistance to wear is not so good as in the case of steel having an equal yield point.

Tests and practical experience tend to show that the removal of the surface metal of malleable-iron castings by machining has very little effect on the strength of the castings other than results from the reduction in area.

The corrosion resistance of malleable iron is perhaps best indicated by the examination of existing parts built up from different materials, which have been exposed to various conditions for many years. In this connection, the following observations are of interest:

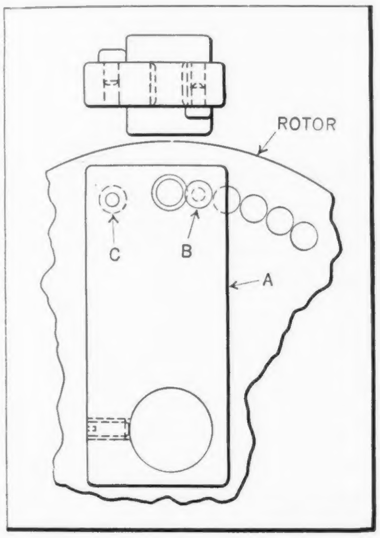
1. Under the action of locomotive smoke, malleable iron shows a decided superiority over wrought iron, basic open-hearth steel, and commercial pure iron.
2. Copper additions in malleable iron up to 2 per cent have been found to materially increase its resistance to corrosion in locomotive smoke.
3. Copper additions to malleable iron decrease its resistance to corrosion in acid mine water.
4. Malleable iron without copper, protected by a hot-dip galvanized coating, shows a decided superiority over steel similarly protected after a service of seventeen years in an atmosphere contaminated by smoke.
5. A hot-dip galvanized malleable iron, with or without copper, will have a heavier iron-zinc alloy layer than wrought iron, basic open-hearth steel, or commercial pure iron, when galvanized under identical conditions.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Drill Jig Used in Balancing Rotors

Certain rotors are balanced by drilling out metal close to their peripheries. For this purpose, a simple spacing jig like the one shown in the illustration is used. Only one drill bushing is employed in this jig; and double or single spacing of the drilled holes may be obtained, depending on the amount of metal to be removed to balance the rotor.



Only One Drill Bushing is Provided in this Jig for Drilling Single or Double Spaced Holes

The jig consists of a cold-rolled steel plate *A* provided with a centering plug which extends through both sides of the plate. As shown, the jig is in position for drilling the first hole. In drilling this hole, no locating means are provided. After it is drilled, however, the jig is swung around until the locating pin *C* drops into the drilled hole, after which the second hole is drilled. Additional holes are drilled in a similar way, each hole being located from the preceding one.

After a certain number of holes have been drilled in this way, the rotor is tested for balance. If more metal is required to be removed, the other side of the jig is placed against the rotor. In this case the locating pin *B* is inserted successively in the already drilled holes, in order to position the drill bushing for drilling the intermediate holes.

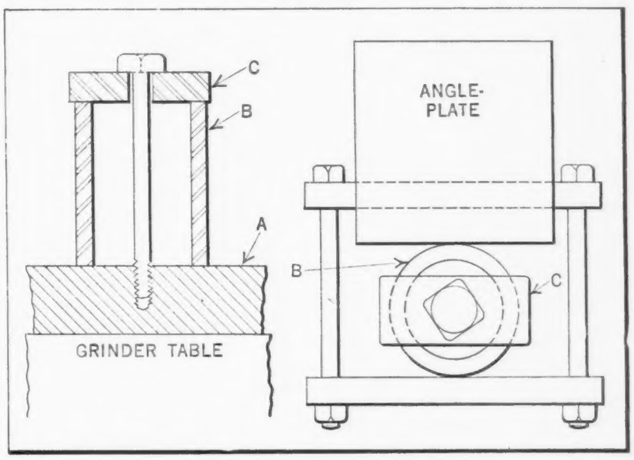
Belleville, N. J. J. E. FENNO

Simple Equipment for Grinding Angle-Plates

A number of 6-inch angle-plates like the one shown in the accompanying illustration were required to be ground very accurately. The only available machine for the job was an old universal grinder. This machine, however, performed the work in a very satisfactory manner when provided with the simple equipment illustrated.

A piece of steel tubing, about 8 inches long, having an outside diameter of 4 inches and a wall thickness of about 1/2 inch, was chucked in a lathe and the outside ground true for a length of about 6 inches. The ground portion of the tube was held within a tolerance of less than 0.0001 inch on the diameter. The end of the tube was next ground true at right angles with the sides. Grinding the tube in this way served to square up the end with the axis, thus making the end square with the sides of the tube within very close limits. The tube was cut off to a length of about 5 1/2 inches. A cast-iron plate *A* with a 1/2-inch tapped hole near the center was next firmly bolted to the table of the grinder. The surface of this plate was then ground very accurately.

The tube *B* was clamped to the surface of plate *A* with the ground end resting on the ground surface of the plate, a strap clamp *C* and a 1/2-inch bolt being used for this purpose. The angle-plate was then bolted to the side of the ground tube, using two strap clamps and two bolts or a C-clamp, as shown in the view to the right of the illustration.



Set-up for Grinding Angle-plates

The angle-plates were all ground by clamping them to the simple fixture in this way. Similar methods of grinding can be employed for other work having two surfaces that must be at right angles.

Philadelphia, Pa. H. C. SHEAFFER

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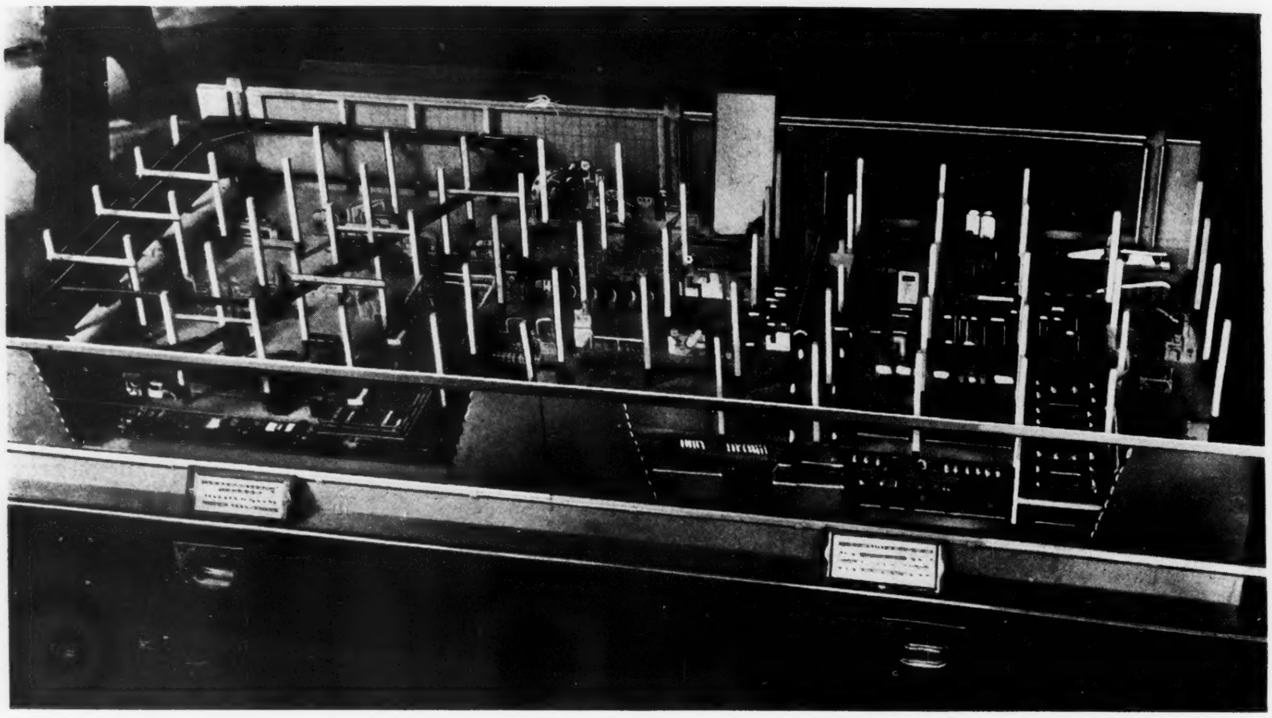
In the course of the last five years, the Soviet Government has built twenty-five large metallurgical plants, sixty-three machine-building plants, and twenty electric supply factories.



The Value of Models to Engineers

Fig. 1. One Section of a Working Model of the Plant in which De Soto Automobiles are Manufactured. More than One Million Parts were Used in Making This Model

WHEN the designer has completed his lay-out drawings for an automobile, airplane, or other mechanical product that must be attractive as well as serviceable if it is to sell, he can easily visualize the sides, ends, and top of the new product. However, it is exceedingly difficult for him to picture in his mind's eye just what a car or airplane will look like when seen from the many different angles at which it will be observed by a prospective buyer.

For this reason, many manufacturers, before equipping their shops for the production of a new automobile, for example, have the proposed car constructed in miniature from the lay-out drawings, even before detailed drawings are made. Then, if a fender, radiator, or bumper is not harmonious with the remainder of the design, the desired change can be made without scrapping dies or other tools. Photographs can be taken of the model from various angles and with different lighting effects. The models are made so remarkably like the real objects that it is sometimes difficult to believe that the picture is of a model rather than of an actual automobile. The photographer can bring outdoor settings into the pictures to carry the illusion still further.

Models for studying the appearance of contemplated ships are used extensively by the Navy Department. These are not toys for maritime museums, but rather tools that insure good engineering design.

Models are useful to the engineer, however, not only in studying the appearance of a product, but also in making various tests to determine the stresses that will be imposed on proposed structures. For this purpose, a model was built from brass strips of the Kill Van Kull Bridge, that connects Staten Island with New Jersey before the bridge was constructed. From tests conducted on this model, it was found that a silicon steel could be used extensively in building the bridge, instead of a proposed steel of another alloy, at a large saving in cost. This bridge model was made by the H. E. Boucher Mfg. Co., 150 Lafayette St., New York City, which operates a plant devoted exclusively to the making of models and high-grade mechanical toys.

In engineering schools, models, of course, have always been very useful for instructing the students. They are also employed in a similar manner by manufacturers to demonstrate to prospective buyers just how a product functions. Models are also widely employed for advertising purposes, especially at industrial expositions. For example, the Boucher company recently reconstructed in miniature the plant of the De Soto Motors Corporation. This model illustrates steps in the assembly of De Soto automobiles from the very beginning until the

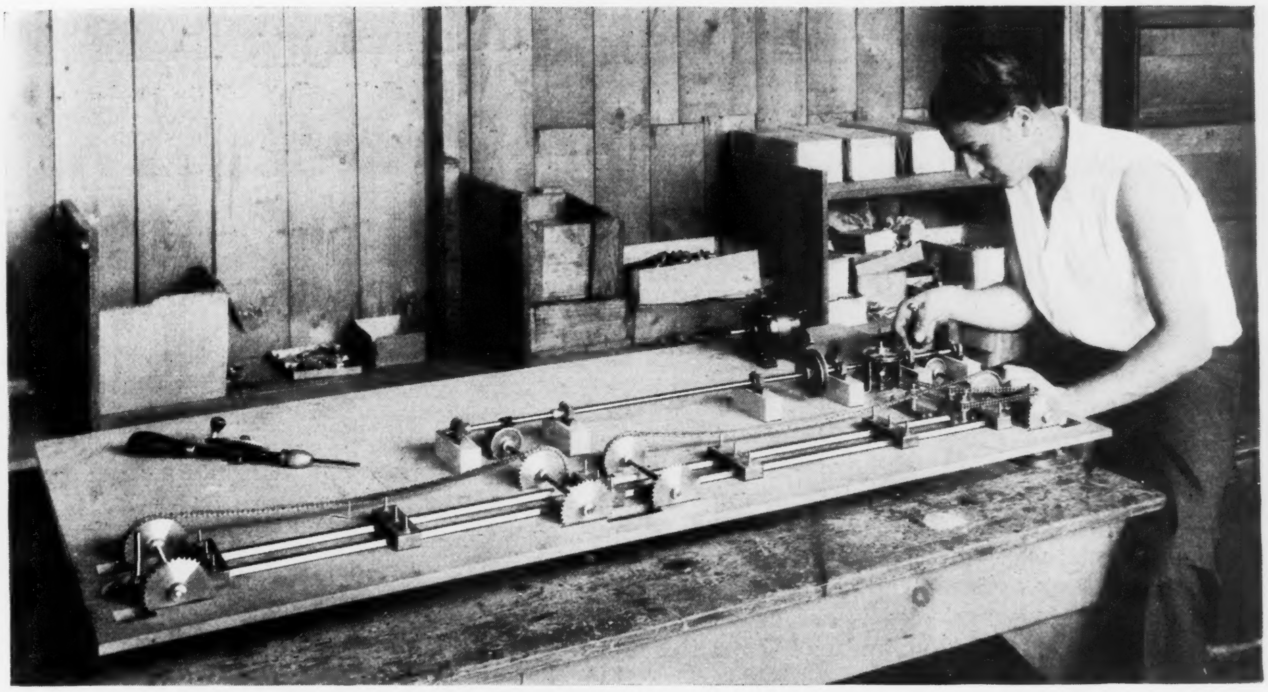


Fig. 2. Assembling the Operating Mechanism on the Under Side of One Section of the Model of the De Soto Automobile Plant

finished automobiles are loaded into freight cars. It is a "live" model, operated by an ingenious mechanism beneath the floor. More than 1,000,000 parts were used in the making of this elaborate model; Fig. 1 shows one section of it. Machines, automobile parts, etc., are faithfully reproduced. Fig. 2 shows the assembling of the operating mechanism, on the reverse side of the board.

The models are generally constructed almost entirely of brass, steel, cast iron, and lead alloys. Watchmakers' lathes and other small-sized equipment, including drill presses, universal milling machines, punch presses, squaring shears, and bending rolls, are the tools used.

Taylor Society Discusses Unemployment

The problem of unemployment was the principal subject of discussion at the meeting of the Taylor Society held December 7 to 9 at the Hotel Pennsylvania, New York City. In discussing this subject, Dr. H. S. Person, managing director of the Society, said: "The nation faces two alternatives. If business and industry are not able to work out of the depression by their own efforts, a measure of government control of enterprises appears inevitable.

"Just what will happen and just how far the government will step into the private business field, as it already has begun to do through the Reconstruction Finance Corporation, depends upon whether effective leadership steps forward from the ranks of private enterprise before deficits, defaults, depression, and unemployment have gone too far.... The problem is purely a business and industrial one. Unless business and industry themselves find leaders within their own ranks willing and competent to shoulder the responsibility of readjusting the economic system and re-establishing it upon a sound basis, with long-view planning as a foundation, the government will be forced in. There is no other alternative."

Current problems of industrial management were discussed by James D. Mooney, president of the General Motors Export Corporation. Harold V. Coes of Ford, Bacon & Davis, Inc., spoke on "How Can the Industrial Engineer Help Management?" Other subjects dealt with were "The Influence of Scientific Management in American Industry," by Sanford E. Thompson, president of the Taylor Society, and "Observations on Management in the Soviet Union," by Mary van Kleeck, director of the Department of Industrial Studies of the Russell Sage Foundation. Frederick M. Feiker, director of the Bureau of Foreign and Domestic Commerce, spoke on "Marketing Costs and Economic Planning."

* * *

In a paper read before the British Iron and Steel Institute, it was stated that a cast iron suitable for hardening by the nitrogen hardening process has been developed in Great Britain.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

D. W.—We have an order for bevel gears, the teeth of which must be of uniform depth along their entire length. Can you tell us of a simple method of cutting these teeth or refer us to some book in which such a method is described?

A.—It is doubtful if any information is available in book form on cutting bevel gears with teeth of uniform depth. A rather simple method, however, that has been used successfully in one plant for doing this work is as follows: The pitch-cone angle is determined in the usual way, and the teeth are cut with a regular spur-gear cutter. The number of teeth for which this cutter is selected is determined by multiplying the diametral pitch by twice the radius R (see illustration).

If the pitch is large enough to warrant taking a stocking or roughing cut, this is done with the gear in its central position; that is, with the central plane of the gear coinciding with the central plane of the cutter. The gear blank is then rotated away from the machine spindle one-quarter of the indexing movement required for one tooth spacing (or one-quarter of the number of holes in the index-plate required for a full indexing movement).

The milling machine table is now moved back toward the spindle a distance equal to one-quarter of the pitch, or one-half the tooth thickness at the small end. In this position, the gear is ready for the first side cut. After taking this cut, rotate the gear blank toward the machine spindle an amount equal to one-half the indexing movement. Then move the table forward a distance equal to one-half the pitch at the small end of the teeth. This movement is equivalent to the tooth thickness at the small end. The gear blank is now in position for the second side cut.

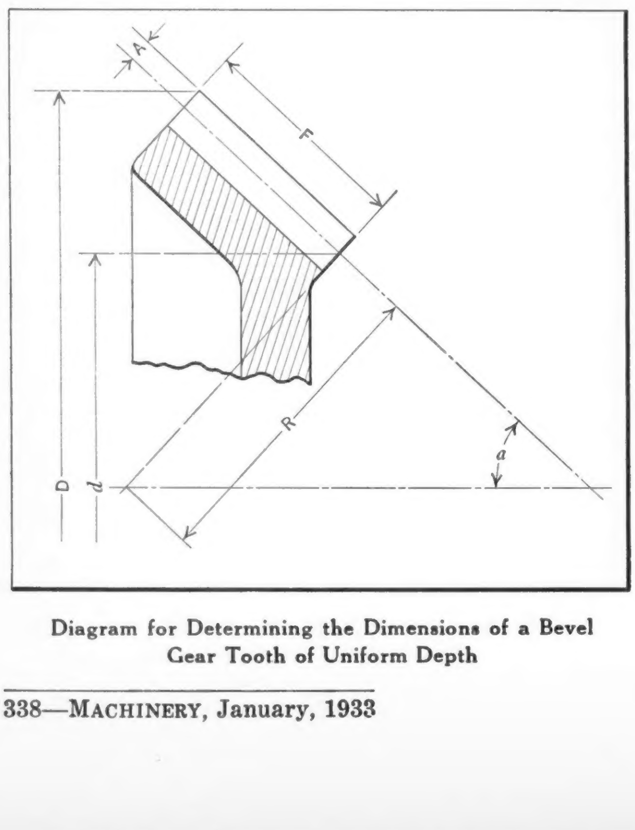


Diagram for Determining the Dimensions of a Bevel Gear Tooth of Uniform Depth

Bevel gears milled in this way can be used without any modification of the tooth form by filing, such as is required in cutting bevel gears of the tapering tooth form by the milling process. In determining the outside diameter of the gear blank, the following formula may be used:

$$D = d + 2F \sin a + 2A \cos a$$

The writer does not know whether or not this form of tooth is superior in strength to the regular tapered form. It appears, however, to be much heavier and stronger.

Stainless Steels for Resisting Corrosion

R. C. H.—Please describe briefly the principal kinds of stainless steels now available and compare their corrosion-resisting qualities.

A.—For simplicity, the stainless steels may be divided into four main groups, each having varying carbon contents, as follows:

Group 1. Low chromium (10 to 14 per cent)
Group 2. Medium chromium (16 to 30 per cent)
Group 3. Chrome-nickel (18 per cent chromium, 8 per cent nickel)
Group 4. Chrome-nickel with other additions

According to a paper presented before a recent meeting of the American Society for Steel Treating by two members of the metallurgical department of the Republic Steel Corporation, these alloys will satisfactorily resist the following types of attack: (a) Atmospheric corrosion, Groups 1, 2, and 3; (b) immersion or liquid corrosion, Groups 2 and 3; and (c) scaling at high temperatures, Groups 2, 3, and 4.

A new free-cutting stainless steel which has interesting possibilities was described in October MACHINERY, page 136. This new material contains selenium, and is said to have some advantages from the corrosion-resisting standpoint, in addition to being so easily machineable that it can be cut in automatic screw machines at from 60 to 70 per cent of the speed used for ordinary Bessemer screw stock.

* * *

Some economists write as if they had made a new discovery when they record the fact that production per man and per man-hour has been greatly increased by the use of machinerv.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

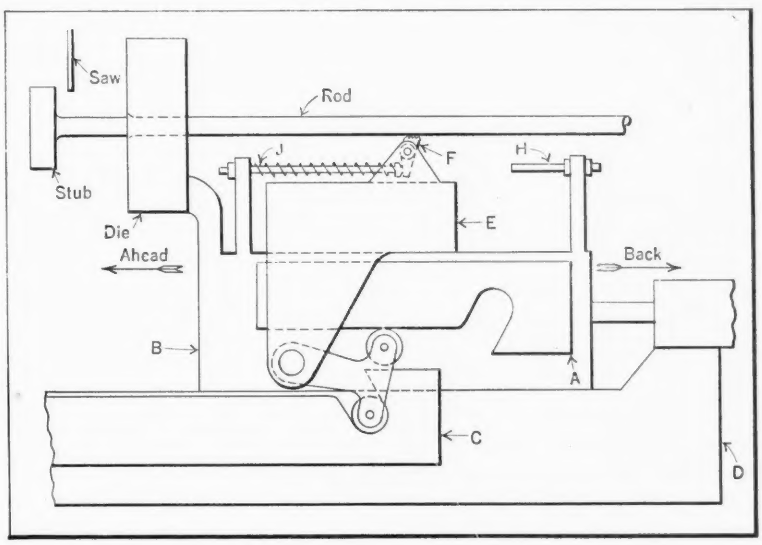
Latch Mechanism for Operating Two Slides Intermittently

By F. L. DAVIS, JR.

In connection with a certain extrusion process, it was found necessary to withdraw two sliding members of a stripping mechanism up to a predetermined point, after which one slide had to remain stationary while the other completed its full travel. On the return stroke, the stationary slide had to be "picked up" and carried along with the other slide. The accompanying diagram shows how this is accomplished by the use of a swinging latch, the principle of which might well be applied to other devices where one of a pair of slides must have a temporary dwell. This latch operates between two flat profile cams with oppositely disposed notches shaped to receive the rollers on the latch.

The upper cam *A* is secured to the moving platen or slide *B*, while the lower cam *C* is fixed to the bedplate *D*. The carriage *E* has a limited range of sliding movement on the slide *B* equal to the longitudinal distance between the two cam notches when the platen is in its "back" position. At both ends of the carriage travel, adjustable trip-rods *J* and *H* engage and disengage pawls *F*, respectively, these pawls gripping the extruded rod.

As soon as the "stub" has been severed from the rod by the saw, the slide *B* is started ahead. At this time the rod is held stationary by the pawls *F* on the carriage, which is now anchored to the bedplate; as the die is attached to the moving slide, the effect is to strip the die from the rod. When the two notches in the cams come opposite each other, the latch swings out of the lower notch and into the upper one, so that the carriage is picked up and carried along with slide *B*. Just before the latch swings upward, at which time the rod is clear of the die, the rear trip-rod *H* releases the pawls, leaving the rod free to be removed.



Two Slides, One of which is Operated Intermittently by a Latch Actuated by Opposing Cams

Transfer Mechanism for Stacking Parts on Rods as They Leave the Die

By R. H. KASPER

In making parts such as shown in the lower right-hand corner of Fig. 1, it was necessary to stack them on rods with the irregular-shaped holes in correct alignment as they left the combination piercing and cut-off die. Stacking the parts in this manner facilitates subsequent operations. The transfer mechanism shown in Figs. 1, 2, and 3 provides an efficient means for stacking the parts. It is mounted at the right-hand end of the die and is operated by a cam attached to the punch-holder, the parts being stacked on rod *W*.

Referring to Figs. 1 and 2, the punch-holder *A* carries the piercing punch *B* and the cut-off punch *C*. On block *D*, which is secured to the die-bed, are mounted the slides *E* and *F*. Slide *E* carries the auxiliary cross-slide *G* which supports the shaft *H* at its left-hand end. The right-hand end of this shaft is supported by a double overhanging bearing which is part of slide *E*. The left-hand end of shaft *H* is enlarged and recessed to slip over the end of the work shown at *J*.

Slide *F* is given a reciprocating movement by means of the cam *K* on the punch-holder through lever *L* and roller *M*. Bracket *X* supports lever *L* at its upper end. Slide *E* is backed up by the spring *N* on the

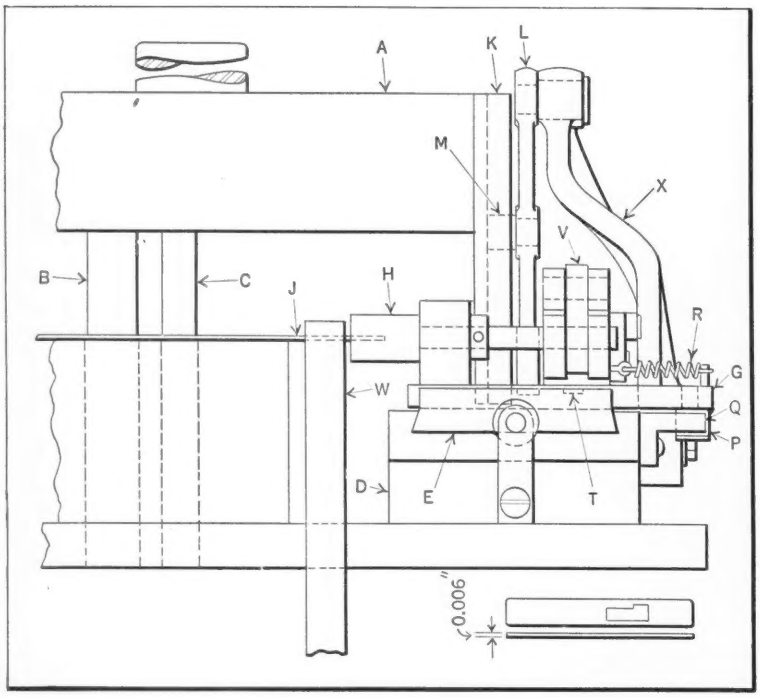


Fig. 1. Front Elevation of Mechanism for Transferring Parts Direct from the Die to the Stacking Rod

flanged stud *O*. The flange of this stud serves as a stop for slide *E*. Slide *G* carries roller *P*, which is held in contact with cam *Q* by spring *R*. Slide *E* carries the spring-actuated latch *S* which engages slot *T* in slide *G*, and is connected to slide *F* by the slotted link *U*.

As indicated in all three views, the ram is in its lowest position. The strip has been fed toward the right, its end entering the recess in shaft *H*. The part is then pierced and cut off by punch *C*. Slides *E* and *F* (see Fig. 2) are in their extreme right-hand positions. Latch *S* is held up out of engagement with slot *T* by link *U*, the screw at the rear end of which is in contact with the rear of slide *F*. Slide *G* is at its extreme left-hand position (see Fig. 1) with the roller *P* in contact with the low part of cam *Q*. It will be noted in Figs. 2 and 3 that the front edge of work *J* is in alignment with the axis of the shaft *H*, so that when this shaft rotates, the work will rotate around its own front edge.

As the ram ascends, the cam *K*, acting on lever *L*, moves slide *F* toward the left until its inner end is in contact with the inner end of slide *E*, which, up to this point, has remained stationary. Prior to this, the motion of slide *F* has been transmitted to link *V*, which causes shaft *H*, to which the link is keyed, to revolve 90 degrees. At this point the work is standing on edge. Latch *S* has been permitted to swing downward; but as it is not in alignment with groove *T*, it merely rests on top of slide *G*.

Further upward movement of the ram causes slide *F* to push slide *E* toward the left, so that the work is placed over rod *W*. As the ram continues to move to the top of its stroke slide *G* is drawn to the right by the action of roller *P* on cam *Q*. The work cannot follow this movement, being restrained by the rod *W* in the work-slot; hence shaft *H* is entirely removed from the work, allowing the latter to drop to the bottom of the rod. At this point in the cycle of operations, slide *G* is in its original position, at which time latch *S* is free to drop into the groove *T*, thus locking slide *G* to slide *E*.

As the ram descends, slides *E* and *F* move toward the right until the flange of stud *O* comes in contact with block *D*, which discontinues the movement of slide *E*. The movement of slide *F*, however, continues, and through link *V* revolves shaft *H* to its original position. As slide *F* approaches the end of its return movement, it engages the adjustable screw on link *U*, disengaging latch *S* from slide *G* and causing this slide to be drawn to the left (see front elevation, Fig. 1) by spring *R*. After slide *G* moves toward the left, the enlarged end of shaft *H* is in position to receive the end of a new part, thus commencing another cycle of movements.

Rod *W* is about 4 inches high and will accommodate 500 pieces. It can easily be removed from the die when it has been completely filled, and replaced by another rod, after which the cycle of operations is repeated.

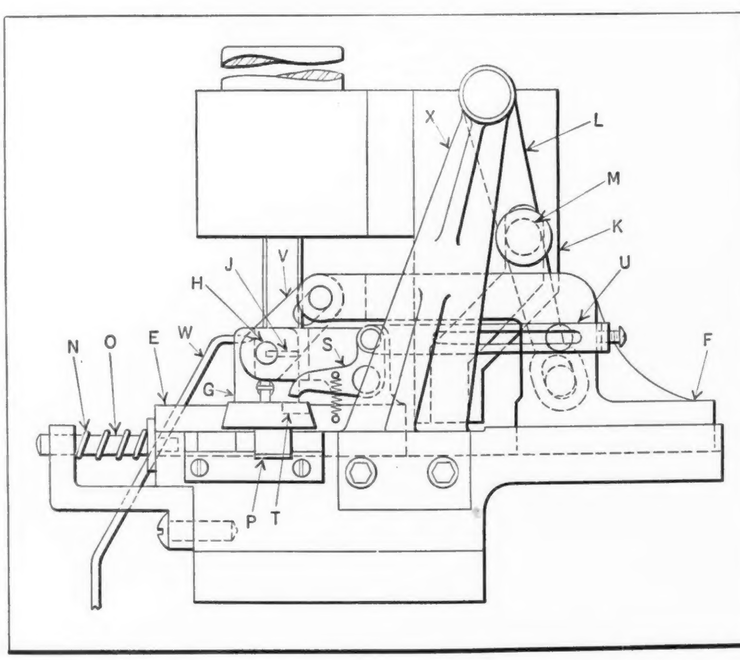


Fig. 2. Side Elevation of Transfer Mechanism, Showing the Action of the Slides Operating the Transfer Member

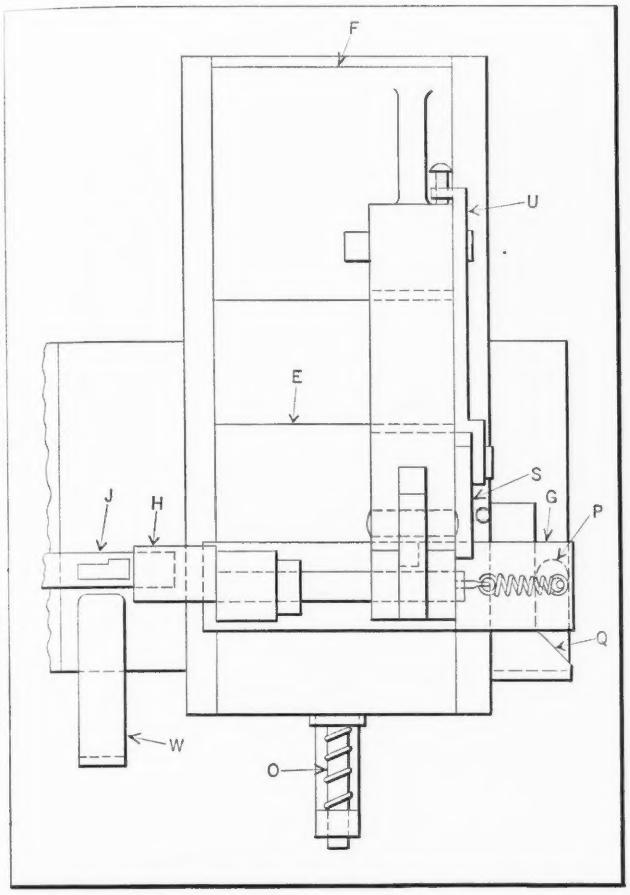


Fig. 3. Plan View of Transfer Mechanism, Showing the Position of the Part after Entering the Transfer Member

Device that Causes Sprocket-Chain Conveyor to Dwell at Regular Intervals for Loading

By J. E. FENNO

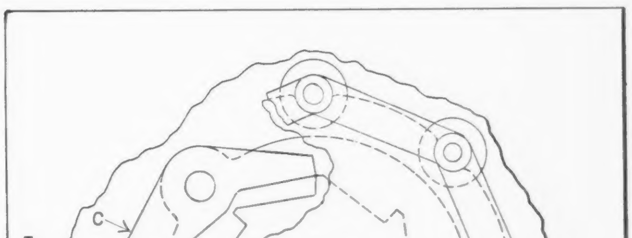
Endless sprocket-chain conveyors are used extensively for carrying lacquered or paint-sprayed parts through drying ovens. The work-holders, as a rule, are mounted at each link joint. In one application of this type, the chain travels a distance equal to the length of seven links and then dwells long enough to allow these links to be loaded by means of an automatically operated feeding device. This alternate movement and dwell of the chain is repeated continuously, so that the chain is always fully loaded as it passes through the oven.

The arrangement for obtaining this intermittent movement is shown in the illustration. It consists of driving sprocket *A*, ratchet wheel *B*, pawl *C*, and driving sleeve *D*. In each link joint of the chain is mounted a slender shaft, threaded at its upper end for a work-holder. The lower end of these shafts is provided with a roll, which, at a certain point in the chain travel, comes in contact with a rapidly moving endless leather belt (not shown). This causes the shaft, work-holder, and work to rotate, so that the paint or lacquer being applied will be distributed evenly.

Both the sprocket and ratchet wheel are keyed to shaft *E*, which turns freely in the sleeve *D*. The sleeve is rotated continuously in a clockwise direction by another member of the machine, and at its upper end is pivoted the ratchet pawl. As indicated, the pawl has been forced out of engagement with the ratchet wheel by pin *F*. This causes the sprocket and chain to dwell long enough for seven work-holders to be loaded. As sleeve *D* continues to rotate, the outer end of the pawl passes by pin *F*, permitting the other end of the pawl to engage the next tooth and carry the sprocket wheel around to the position shown. Here, the pawl is again forced out of engagement with the ratchet, causing the sprocket wheel to dwell a sufficient time for seven more work-holders to be loaded. The movements described are repeated for each succeeding revolution of sleeve *D*.

* * *

It has long been axiomatic that "the power to tax is the power to destroy," and there can be no doubt that most of our taxes are better adapted to drying up the nation's income than to yielding a large revenue, being placed to penalize rather than encourage economic endeavor.—*Commerce and Finance*



Ratchet Mechanism that Disengages a Sprocket Wheel from its Driving Member at Regular Intervals to Obtain an Intermittent Movement of the Chain

The Shop Executive and His Problems

Superintendents and Foremen are Invited to Exchange Ideas on Problems of Shop Management and Employe Relations

EACH day my mail brings sheets of manufacturing information, ranging in size from a calling card to 22- by 36-inch wall charts. Most of these data sheets would be saved if they were of a standard size. We have standardized so many other things; why not standardize the size of data sheets?

I have an 8 1/2- by 11-inch binder. About one per cent of the sheets coming to me fit this binder. The remainder would require many binders of different sizes.

I appreciate the value of a self-compiled list of data sheets pertaining directly to my line of work, but I find it almost impossible to keep all this data because of the hundred and one different sizes of sheets on which it is printed.

Would it not be possible for manufacturers of lock-washers, set-screws, ball bearings, clutches, etc., to decide on a standard size data sheet that could be instantly slipped into a loose-leaf binder or conveniently filed away in a standard-size letter file? C. H. HAYS

Encouraging Promptness in Late Comers

We have very few late comers in our plant. This is the result of a simple system which, strange to say, neither pays bonuses for promptness nor exacts penalties for tardiness. Like many other factories, we had two types of late comers—the "chronic" and the "once-in-a-while" kind. After trying out different methods of encouraging promptness with little success, the suggestion offered by the general foreman was adopted. His idea was to capitalize the individual's pride and to show up chronic cases which might lead to discharge.

Every foreman posts score sheets on the bulletin boards of his department, showing the standing of each man as to the number of times he is late during the week and month, as well as the total time lost and the amount that should be deducted from his pay. Similar score sheets are also kept in the drafting, production, cost, and engineering departments. In the general manager's office summary curves of all sheets are kept, on which every man is represented. At the end of the year, the totals for each man and each department are posted on the bulletin boards. This total looks staggering, as contrasted with the piecemeal weekly items.

Of course, there are occasions when a worker has a good reason for his lateness; but that is likely to happen only once in a great while. In cases of this kind, when men have encountered unavoidable delays, either at home or on their way to work, and where the time is more than half an hour, pay deductions are made, but no mark is placed against the man's record.

The score sheets, called "Everybody's Mirror," are changed at the end of each month. What gets the most attention is the notation on the bottom of the sheet, in heavy bold type. "This is your mirror—It reflects your standing in this company. When opportunities for promotions or necessities for lay offs occur, we look in the mirror." And in the next line below a request is made to send all copies of "Everybody's Mirror" to the superintendent's office for file, at the end of each month.

Thus all late comers get plenty of publicity, from the general foreman down. The results have been far beyond our expectations. Occasionally the boys at the bench get a hearty laugh when some of the bosses happen to be late, giving them a chance to "get even" with their superiors. It is a friendly competition throughout, but it has a marked effect on increasing punctuality. JAMES J. BAULE

Keeping Manufacturing Equipment Up to Date

A large manufacturer in the Middle West has effected great economies by maintaining a staff of men whose activities consist simply in suggesting and developing improved methods for making the company's product. In this product, 57,000 different parts are used. The men engaged in devising improved methods are free to go into every manufacturing department of the plant. They observe present practice and are constantly trying to find new means that may lead to higher quality, lower costs, or both.

Special machinery is used to a large extent in this plant. Suggestions for the design of equipment, as well as for material-handling methods, heat-treating, enameling processes, and tooling equipment, all come within the field of activity of these efficiency engineers. They also recommend the buying of standard machine tools of improved design whenever they find old machines and methods in use. OBSERVER

[Methods used in other shops for keeping up to date would be of interest to the readers of MACHINERY—EDITOR]

Production of Machine Tool Accessories and Precision Tools and Instruments, 1931 and 1929

Kind of Equipment	1931	1929
Machine tool accessories and machinists' precision tools and instruments made in all industries ...	$73,153,127	$183,138,948*
Made in the "Machine tool accessories and machinists' precision tools and instruments" industry	59,991,443	134,273,247*
Made as secondary products in other industries	13,161,684	48,865,701
Attachments and fixtures, total value	$46,455,936	$98,143,962
General equipment:		
Chucks		
Drill	338,044	1,311,792
Lathe	574,716	2,725,483
Magnetic	84,908	360,495
Vises (machine)	93,392	182,232
Attachments for machine tools:		
Boring machine	215,628	†
Drilling machine	374,882	†
Lathe (engine)	200,168	†
Other machine tools	814,643	†
Special equipment:		
Jigs and fixtures	4,276,792	20,014,120
Sub-presses, punches, dies, etc., for punch, stamping, and forming presses, etc.	27,363,966	46,510,752
Die-casting and drop-forging dies	431,113	1,270,754
Tools for screw and automatic machines (box-tools, hollow mills, work- and tool-holders, etc.)	1,233,659	4,056,307
Specially designed tools	2,742,557	5,657,978
Special machinery (other than machine tools), model and experimental work	2,281,673	5,066,984
Other attachments and fixtures	2,044,733	6,357,683
Attachments and fixtures not reported separately	3,385,062	4,629,382
Small tools and machinists' precision tools and instruments, total value	26,697,191	84,994,986*
Arbors and collars	99,449	364,716
Collets (lathe, milling machine, and drill)	72,004	345,523
Counterbores	323,358	1,116,719
Countersinks and combination countersinks and drills	184,514	65,222‡
Drills:		
Carbon	1,845,137	4,096,029
High-speed	3,052,284	9,911,434
Hobbing cutters (principally high-speed)	1,106,139	2,078,916
Lathe, planer, and shaper tools (not including tool-holders), principally high-speed	540,261	1,140,643
Milling cutters (all types), end-mills, etc.:		
Solid		
Carbon	182,517	
High-speed	3,143,005	10,704,526
Inserted-tooth	804,833	
Reamers (solid, expansion, and inserted-blade):		
Carbon	808,359	3,114,356
High-speed	1,334,437	5,042,556
Threading tools:		
Taps and dies, not pipe-threading		
Taps		
Carbon	1,157,283	3,526,272
High-speed	1,225,271	3,069,694
Dies		
Carbon	670,232	1,337,119
High-speed	185,778	1,362,676
Chasers	1,345,633	3,251,469
Pipe-threading		
Taps	261,046	300,435
Dies	532,425	1,346,867
Pipe stocks complete with dies	1,083,890	2,338,528
All other cutting tools, tool-holders, etc.	2,659,996	
Precision measuring tools (micrometer and vernier) and gages (plug, ring, thread, etc.)	2,069,012	30,481,286
Other measuring tools	1,209,764	
Small tools not reported separately	800,564	

*Revised. †Reported under "Other attachments and fixtures" for 1929. ‡Countersinks only; not comparable with item for 1931.

Production of Machine Tool Accessories and Tools in 1931

The Bureau of the Census, Washington, D. C., has compiled a tabulation relating to the production of machine tool accessories, cutting tools, precision tools, and measuring instruments in 1931. This compilation shows that the value of machine tool accessories and precision tools and instruments made in the United States in that year amounted to over $73,000,000, a decrease of 60 per cent, as compared with 1929, when the production exceeded $183,000,000.

This industry, as defined for census purposes, embraces establishments whose principal products are twist drills, reamers, milling cutters, taps, dies, etc., and those specializing in the production of dies, jigs, fixtures, precision measuring tools and gages, and special tools.

In 1931, there were 718 establishments engaged in this branch of the industry, employing an average of 17,500 wage earners to whom $26,560,000 was paid in wages. The accompanying table lists the production of different classes of tools in detail, comparing the production with that of 1929. It will be noted that the production in 1931 was less than one-half of that in 1929.

* * *

The Leipzig Trade Fair

The Trade Fair at Leipzig, Germany, which has been an annual event for seven hundred years, will be held this year from March 5 to 12, and will be approximately five times the size of any pre-war fair. It will have exhibits from thirty-two countries. Among the exhibits will be a very large machine tool and general machinery exposition, held in the building erected especially for that purpose at the Fair.

Should We Strive for Stabilization in Industry?

Is the Idea that Industry Can be Stabilized a Mere Dream, or is It Practicable?—Some of Our Most Prominent Industrial Leaders Believe that Stabilization is Good Business

By L. M. WAITE,* South Norwalk, Conn.

MOST business men are giving a great deal of thought to the constantly recurring condition of unemployment. It is agreed that it would be highly desirable to find some means of insuring that idle plants and idle men will no longer be a regular occurrence in the history of industry.

Much has been said about stabilization of industry as a means of accomplishing this. What do we mean by stabilization? For the purpose of this article, we may define stabilization as the establishment of a condition under which factories running full time, steady employment in industry, and sustained purchasing power are assured. Briefly, stabilization provides a chance for everybody willing and able to work to make a living—an American standard of living. In a stabilized industry, there will be a regular flow of products that are regularly used and consumed.

To attain such a condition is not an easy matter. No one could suggest offhand the means by which it might be accomplished. Industrial stabilization can be achieved only through long periods of development and experimentation, because the first plan is not likely to prove perfect. But, if industrial leaders become convinced of the practicability of such a plan, its ultimate success is assured.

This is a national business problem that will put the resourcefulness of American industrialists to a test such as they have never before faced. We have justly prided ourselves on being the greatest industrial nation in the world; but if we are to retain that distinction, we must continue to progress along sound industrial lines. The high reputation of American business men for ability will not, of itself, maintain our industrial superiority in the future, any more than a football team can expect to win every game simply because the players wear the emblem of a great university.

An Outline of the Problems Ahead

The first step to be taken by American industry, if it is to establish stabilized conditions of business, is to inform itself concerning the problems to be solved: (1) We must determine definitely what we mean by stabilization and what it is that we want to accomplish; (2) we must suggest a plan by which it can be secured; (3) we must determine whether the cost of this accomplishment is worth what we hope to achieve; and (4) we must convince industrial leaders and business men throughout the nation of the merits of the proposal as an alternative to many of the short-cut "isms" that are advocated.

This last objective is probably the most difficult. It will be necessary to convince not only a large majority of all the owners and managers of business throughout the nation, but also a majority of influential and thinking men in every walk of life.

The first objection that will be raised to a plan such as suggested will be that it interferes with the "rights of free competition." However, it is likely that the "right of man to work" is just as fundamental. Unbridled "free competition" has not proved an unmixed blessing in industry. It has been the primary cause of business booms and business depressions, of business failures, bankruptcies, and unemployment. The right of free competition is maintained at the cost of these periodic parades along Charity Lane. This price, many industrial leaders are now beginning to think, is too high.

Planning Ahead is the Fundamental Idea of Good Management

We know that in an individual plant, planning is necessary. What would be the condition of an automobile plant if the superintendents of the chassis division, the engine division, and the body division worked independently, producing what in the "judgment" of each would be the right number of units, and in sizes and qualities to suit their own ideas? How would the assembly department fare and how long would it be before such a business would be in the hands of receivers?

However, whole industries, which are merely groups of separate enterprises, are conducted on this very plan. Each individual manufacturer decides for himself what and how much to produce, according to his own ideas of the demand, rather than basing his judgment on the combined knowledge and judgment of the industry. As a result, periods like this find whole industries practically in the hands of receivers—if not actually, at least in effect—the stockholders taking the losses that creditors take in regular receiverships.

Industrial leaders, like Owen D. Young and Gerard Swope, have initiated and proposed to industry plans with a view to obtaining, in one in-

*Author of "You, Me and Business"

dustry at least, a measure of stabilization. Part of the plan—that pertaining to unemployment reserves—has been accepted by the most important branch of the electrical industry. Many able business managers of less national prominence have applied similar plans in their own plants. The seed has been sown. It is now the business of industry to direct the trend of this development along lines that will produce the most lasting results.

Industry Must Begin to Direct Itself Instead of Being Directed by Government

Industry must act for itself or some day the political platforms of the leading parties may contain clauses like the following, which are already incorporated in the platforms of minor parties: "... will be a bureau of experts concerned with *planning* the national production . . ." — ". . . erect a governmental structure whose principal function shall be to *plan* production within the productive and distributive industries . . ."—". . . only by these means will it be possible to organize our industrial life on a basis of *planned* operation . . ." The total combined votes marshalled by the minor parties may some day force the major parties into a position to advocate measures that will adversely affect industry.

The leadership that we have in industry and business has demonstrated a capability, which is lacking in political parties, for developing plans on a basis of mutuality of interest and looking forward to far-reaching results. The managers of industry may well point with pride to the part that industry has played in the development of the high standard of living in this country. This has been accomplished by the plans and systems underlying production. Now these managers must begin to look into the broader field of inter-industry planning, since, obviously, the results of planning in an individual plant become ineffective through lack of planning in the industry as a whole.

Managers of business are constantly asking for "less government in business." This can be accomplished only by industry doing for itself well and effectively that which government will otherwise attempt to do less well. For it is characteristic of business men to see that, to the best of their ability, things are well done, while the viewpoint of politics is to see that things are done in a manner that will secure the most votes when votes are needed.

There is nothing revolutionary about the plans for stabilization in industry that have been proposed by such recognized industrial leaders as those mentioned. It is not necessary to have a "we-want-a-change" attitude in order to endorse these plans. They are merely the logical working out of the ideas of rational management that have brought this nation into the position of the leading industrial power in the world. The proposals are not proposals of impractical men, or of mere idealists that have not gone through the hard school of practical competitive business.

The Function of the Government Should be Only to Referee the Competitive Business Game

Finally, if we ought to have stabilization in industry, who shall make the rules? It is obvious that industry itself is far more competent to do this than any other agency. Our trade associations are the available nucleus for such inter-industry planning as might be put into effect almost immediately. The growth of the trade association movement will strengthen industry in its efforts. Industry, if it will, can assume the power of deciding for itself how it is to handle its problems. Government has seldom stepped in until industry has proved incapable of governing itself. The rules should be made by industry.

Any game, however, requires, besides rules, an umpire—some source of authority for enforcing the rules. Possibly industry can provide the umpire as well; but, if not, it may call upon the government to referee its stabilization game. There is nothing novel about this. Ever since the thirteenth century, mercantile tribunals have passed upon business disputes in Europe; and our own federal government now umpires all of our inter-state activities.

In an article "Suggestions for Inter-Industry Planning," published on page 215 of November MACHINERY, the author outlined in greater detail the reasons for inter-industry planning. The present article is intended as a further development of these ideas and as an answer to some of the questions that may have arisen in the minds of readers. The main object of this article is to stir business into an attitude of determination to supply leadership in the battle against the evil effects of the so-called "business cycle." Such leadership is lacking in the political arena, and if it is to come to the front at all, it must come from industry.

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Contest Sponsored by the American Machinery and Tools Institute

The American Machinery and Tools Institute, 40 N. Wells St., Chicago, Ill., has announced a contest for the best papers submitted on one of the following subjects: (1) Present-day advantages of machinery and tools; (2) a subject for simplification and standardization in the machinery and tools industry; (3) effect of temporary dies on the machinery and tools industry; (4) economic justification of the small machine or tool shop.

Certificates of merit will be awarded for the best papers. The closing date for submitting papers is February 28. Papers should consist of not more than 1500 words each, and will be judged according to ideas submitted, grasp of subject, and usefulness of the paper.

* * *

Only aviators get very far when they go up in the air.—*News Letter, National Safety Council*

Use of Master Models for Estimating and Making Molds for Plastic Parts

The Difficulty of Visualizing Complicated Molds Has Been Overcome by Using Models Made from Modeling Clay and Plaster-of-Paris

By C. B. COLE, President
Tool Equipment Sales Co., Chicago, Ill.

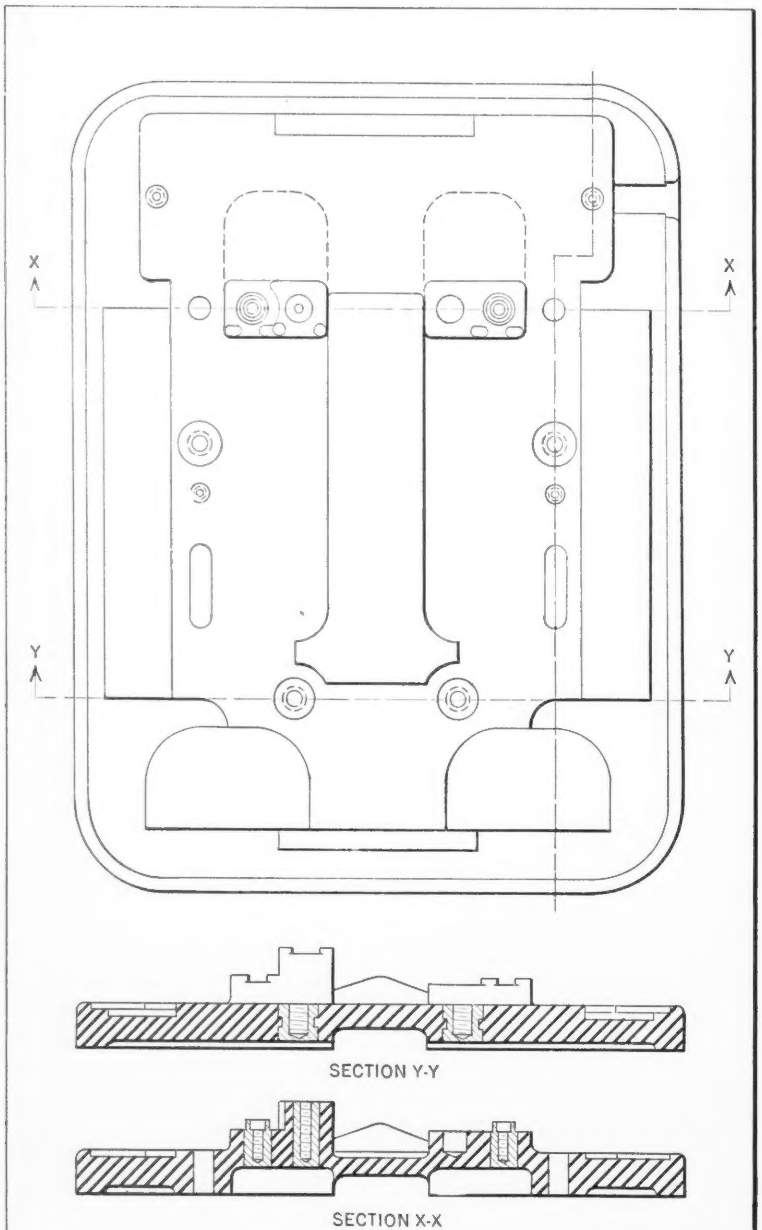


Fig. 1. Back Plate for a Telephone Ringer Box Made from Synthetic Plastic Material in the Mold Shown in Figs. 2 and 3. Note the Metal Inserts Molded in Place

THE designing and building of molds for complicated parts made from synthetic plastics, such as Bakelite or Durez, affords the tool designer a chance to exercise his ingenuity, especially when the job has to be done on a contract basis. This means that the molds must produce parts that will be within the limits shown on the customer's drawing and give him the production he requires. To quote a definite price on such parts, a method often followed by the Service Tool Die & Mfg. Co., Chicago, Ill., is to make up a model part from modeling clay. This rough model enables the man quoting to visualize the job more clearly and to figure his price accordingly.

For the back plates of telephone ringer boxes shown in Fig. 1, the customer required a four-cavity mold to be used in a 200-ton hydraulic press. Incidentally, the weight of this mold, when completed, was approximately 3000 pounds, and the estimated production four pieces every five minutes, or forty-eight pieces per hour. An assembly drawing of the mold was submitted to the customer for approval or correction. After approval, the job was started through the shop.

The punch and cavity sections were first roughed out, and then a mahogany master pattern was made. From this pattern plaster-of-paris models or casts were made of both sides of the part. The casts were then given to the toolmakers to aid them in machining the mold. This combination of the casts and drawings served as an excellent guide in visualizing the shape of the mold while the work was progressing.

The punch or former sections of this mold are shown in Fig. 2. These sections are made from annealed alloy steel, and are mounted on filler blocks and fastened to the upper grid by means of hollow hexagon-head cap-screws. The filler blocks are made of ordinary machine steel, and

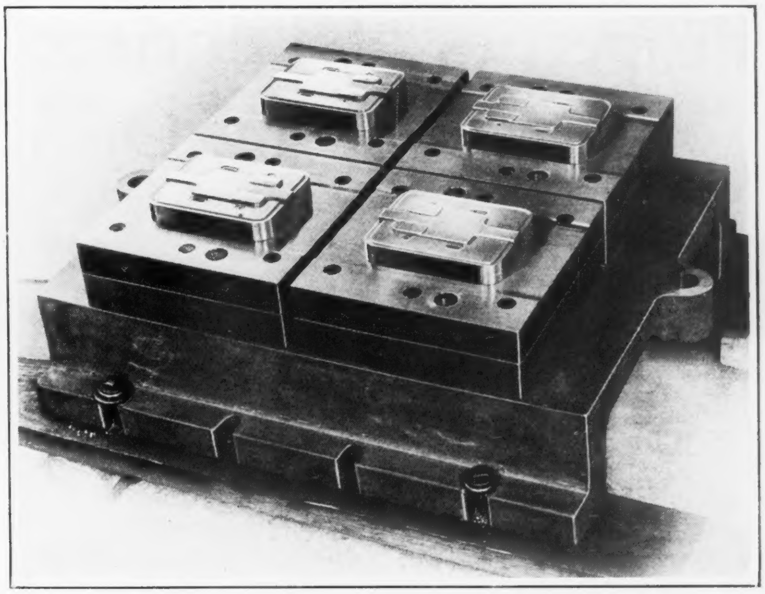


Fig. 2. Punch or Former Sections for the Lower Part of the Mold Illustrated in Fig. 3

are used to maintain the proper die space in the press.

Owing to the shape of the part, it was necessary to provide strippers in the cavity sections, instead of in the former sections as is usually done. The stripping in this case is done by four taper pins in each cavity, the large end of each pin being normally flush with the bottom of the cavity. These stripper pins are actuated by bars mounted in the lower grid.

Fig. 3 illustrates the cavity sections mounted on the lower grid. Provision is made for eleven metal inserts in each section. Individual leader pins are provided for each cavity, and, in addition, a master leader pin is located on each side of the grid. These master leader pins maintain proper alignment between the cavity and the former sections. The brass connections for the pipes supplying superheated steam and cold water to the molds are of the duplex type, and are equipped with gaskets to insure tight joints. One obvious advantage of using connections of this type is that considerable extra piping is eliminated.

* * *

The American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa., has published two sets of specifications for castings—one covering gray iron, and the other, malleable iron. The specifications for gray iron castings cover seven different grades; those for malleable castings, two different grades.

Proposed Standards for Jig Bushings

A committee of the American Society of Mechanical Engineers, working in cooperation with the National Machine Tool Builders' Association and the Society of Automotive Engineers, has published a proposed American standard for jig bushings. This proposal covers dimensions and tolerances for press-fit wearing bushings, renewable wearing bushings, and liner bushings. Copies of the proposed standard can be obtained from the American Society of Mechanical Engineers, 29 W. 39th St., New York City.

* * *

Flexible Splice for Rubber Fabric Belts

A new method of splicing rubber fabric belts designed to promote greater flexibility, so desirable when small pulleys are used, has recently been patented by the Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. In making endless belts by this "extensible tip" method, the outside plies of the two ends are first perforated with a punch. Tie-gum is then pressed into the punched holes and the rest of the joint interlapped, cemented, and vulcanized as usual.

The perforations, which are filled with pliable tie-gum, allow more than the usual extension of the splice when it bends around small pulleys. This process has been designed to eliminate trouble from the splice separating and to extend the life of the belts.

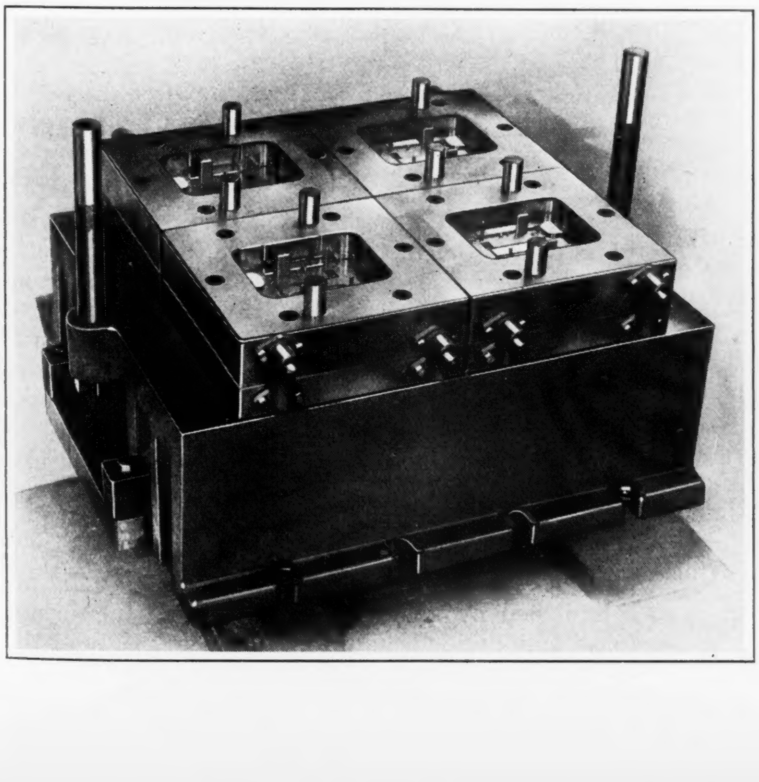


Fig. 3. Cavity Sections of Mold, Containing the Stripper Pins and Provision for Eleven Metal Inserts in Each Section

Properties of Lubricants for Drawing Operations in Presses*

Spoiled and Imperfect Work is Often Caused by Paying Too Little Attention to the Selection and Compounding of the Drawing Lubricant

By H. A. MONTGOMERY, President
H. A. Montgomery Co., Detroit, Mich.

ONE of the most important factors in the efficient production of pressed metal parts is lubrication. Efficient lubrication will effect a greater saving in the average stamping plant than any other single factor, aside from correct tool design and construction.

Of the natural fats and oils sometimes used as sheet-metal lubricants, those of outstanding merit are beef tallow, wool grease, lard oil, castor oil, and elaine oil. Most of the compounded lubricants furnished for this purpose are based upon fatty oils and fats, and, with few exceptions, are all prepared in the form of water-soluble emulsions, varying from solid pasty materials to viscous liquids. Such prepared compounds not only contain basic fatty lubricating material, but may also contain mineral oils which usually have a viscosity ranging between 200 and 700.

Essential Requirements of a Good Lubricant

In preparing lubricants for general stamping plant use, the following physical conditions must be considered: (1) Highest possible film strength; (2) medium coefficient of friction; (3) lowest surface tension; (4) fixed solubility in alkaline and non-alkaline water; (5) oil solubility; (6) stability of the product; (7) non-toxic effect upon workmen; (8) proof against fermentation, decomposition, or other chemical change; (9) proof against corrosion; (10) ease of application; (11) ease of admixing; (12) ease of cleaning; and (13) freedom from odor and general cleanliness of use.

Factors Controlling the Essential Requirements

High film strength is the direct result of the choice of basic ingredients, and the alkaline saponification of the fatty materials used. The extent of saponification determines to a considerable degree the ultimate film strength of the entire lubricant in so far as the oily body is concerned. The more of the fatty substance that is converted to soap, the higher the film strength will be. The coefficient of friction is established through control of the degree of water-solubility of the product and the amount of moisture it contains.

Surface tension is controlled by correct proportioning of the saponified and unsaponified oily bodies. The surface tension of good drawing lubricants should be low, owing to the fact that lubricants generally used for metal cutting and drawing purposes are efficient or inefficient in direct proportion to their wetting properties. The wetting property of any given lubricant is of extreme importance, and this factor is reflected in surface tension.

Fermentation is controlled by means of powerful chemical preservatives. It is, however, extremely difficult to control this factor effectively. Water emulsions, consisting of saponified and unsaponified fats and fatty oils, are likely to ferment readily under warm weather conditions, in spite of all precautions. Benzoic acid, when used in the proportion of one-tenth of one per cent, is a most effective preservative and gives the most satisfactory results. It has no toxic effect upon the workmen.

The main requirement of a good cold-drawing lubricant is high film strength, but it by no means follows that any lubricant having this characteristic is efficient. A satisfactory lubricant must also have the right coefficient of friction and surface tension. Surface tension in all instances should be as low as possible. This appears to be of great importance.

Scored and Ruptured Stampings are Often the Result of Using Lubricants Having Low Film Strength

The principal function of a cold-drawing lubricant is to prevent scoring of the work-piece or breaking of the metal during the drawing operations, as well as excessive die wear. Under the high pressures developed in cold-drawing and pressing operations, the film strength of the oily medium is usually exceeded, especially in the case of heavy-duty work. When the lubricant film is ruptured, seizure of the metal is likely to occur.

It is an impossibility to obtain the required film strength in a drawing lubricant with merely an oil medium, saponified or unsaponified. The film strength of the oily medium must be fortified with materials of a tougher nature. This is usually accomplished by adding solid lubricating materials, in a finely divided condition, to the oily body of the

*Abstract of a paper presented at the 1932 annual convention of the American Society for Steel Treating, at Buffalo, N. Y.

lubricant, so that they are suspended uniformly throughout the mass. The solids must be chemically inert so as not to affect the other ingredients of the lubricant. They must also possess natural lubricating properties. Their function is to aid in preventing metal-to-metal contact. The amount of such solid materials that may be added is usually from 20 to 30 per cent. Solids are not particularly effective in fortifying the film strength of the lubricant if a smaller proportion than 20 per cent is used, and they seldom form more than 35 per cent of the entire formula.

As a rule, the solid material added to drawing lubricants consists of neutral calcium carbonates. There are other substances that may be added, such as lead carbonate, zinc oxide, barium carbonate, talc, Fuller's earth, infusorial earth, and clay. Calcium carbonate seems to be the most effective as well as the least expensive material that may be used.

Objections to Some Mediums for Increasing the Film Strength

Lead carbonate and zinc oxide, while extremely effective as lubricating bodies, are chemically active in the oily medium, and have a marked tendency to produce water-insoluble fatty acid salts. This causes a marked difficulty in cleaning, and therefore such substances are considered objectionable. Talc is unsatisfactory, owing to its high abrasive properties. Barium carbonate also is objectionable, as it seems to promote fermentation. The clays cannot be recommended, due to their high silica content.

Causes of Wrinkles, Uneven Draws, and Rupture

The coefficient of friction is a factor of small importance in a lubricant used for deep-drawn heavy metal stampings of small surface area. However, for light-gage sheet of large area, it becomes a factor of serious importance. If the coefficient of friction is too low, the metal slips too freely into the die cavity, resulting in an unevenly drawn or wrinkled piece. If the coefficient of friction is high, breakage of the sheet takes place at the point of greatest stress.

Excessive adhesiveness of a lubricant has a marked tendency to cause the grain structure of the sheet to open up, owing to the over-stressing of the metal while drawing. In preparing well balanced lubricating mediums for sheet-metal drawing, it is very necessary to consider the coefficient of friction.

Importance of Solubility in a Lubricant

Most cold-drawing lubricants are prepared in the form of water-soluble emulsions. There are several reasons for this; the principal one is the dependence placed upon the soap base of the lubricant. It is only by means of emulsification that the soapy materials can be uniformly dispersed throughout the unsaponified oily portion and maintained in that condition. Another reason for the use of water-soluble emulsions is that the suspension of the solid material is more readily accomplished and the compound is readily suited to various operations by water-dilution on the part of the user. Solubility in alkaline solutions is desirable in the interests of subsequent cleaning operations. Stability against separation is a necessary requirement.

Precautions Should be Taken to Prevent Toxic Poisoning

Drawing lubricants are sometimes compounded of materials that have a toxic effect on the workmen, resulting in poisoning. Lead carbonate is particularly dangerous. In addition, the odor of drawing lubricants should not be unpleasant.

Color is of importance when the lubricant is used on such stampings as automobile fenders and body panels. When these stampings are drawn, uniform lubrication is applied only to those locations on the draw-ring where the metal is expected to flow freely into the die cavity. At other locations on the draw-ring, the metal is expected to hold with little or no movement. No lubricant is applied at those points. A colored lubricant aids the operator in applying it only where required.

Chemical Treatment of a Compound is Required to Produce an Efficient Lubricant

Two of the most important oily substances used as bases for drawing lubricants are, in the order of their importance, beef tallow and castor oil. Of the two substances, tallow, with an approximate film strength of 40,000 pounds and a coefficient of friction of 0.005, is generally satisfactory, when used in its natural state as a drawing lubricant. Its film strength is considerably lower than that of castor oil, which is approximately 60,000 pounds, and its coefficient of friction is ten times lower than that of castor oil, but its wetting power appears to be much higher.

Therefore, it might seem that these two mediums could be compounded to take advantage of the higher film strength of the castor oil and the higher wetting properties and lower coefficient of friction of the tallow. However, the simple compounding of these two substances does not result in a good drawing lubricant; but by chemical treatment—that is, by saponification, sulphonation, and emulsification—we are enabled to take advantage of the peculiar characteristics of each. When they are so blended, they produce remarkable lubricating results.

The Addition of Other Chemicals Have Improved the Lubricating Properties

In late years, the efficient effect of sulphurized lubricating mediums has been noted. By sulphurization of mineral lubricants, it is possible to equal,

and in some instances surpass, the performance of lubricants derived from fatty sources. Sulphurized mineral oils are particularly effective lubricants on punching and shearing operations, on short draws, and on heavy metal where the work must be kept free from scores.

Recently it has been discovered that lubricating mediums treated with chlorine or with chlorine-bearing compounds are greatly enhanced in their lubricating performance. It is interesting to note that the addition of such a volatile substance as carbon tetrachloride to an oily medium so fortifies its film strength as to make it well nigh indestructible when introduced into a machine bearing. The same influence is noted to a lesser degree when applied to lubricants for metal-drawing operations.

A Sane Price and Cost Policy is Essential to Survival in Industry

It is essential to the economic stability and solvency of industry that the products of a plant be sold at such a price as to cover adequate wages and other manufacturing expenses and to provide such reserves as will make it possible for the concern to stay in business over a period of years.

When sales are made at a loss, the manufacturer is shipping a part of his assets along with the equipment that he sells. Further, the seller is destroying, in the buyer's mind, the conception of what is a fair price. It may take him a long time to correct the false impression that he has created. Sometimes he will not be able to do so before his fallacious price policy has forced him out of business. He probably also loses the respect of his customers, who are buying from him solely on account of low price.

The buyer is never confident that he has obtained the best price that he can get; and, as a consequence, much purchasing is held up because the buyer believes that by delay he will obtain still lower prices. This has been the case during the past year, and manufacturers who have constantly shaded prices have been mainly responsible for the slow return of confidence. The manufacturer who sells below cost is undermining the entire industry of which he is a part, and is injuring those manufacturers who are attempting to maintain sound business principles.

Many concerns who have sold without regard to costs during the past year or two will be looking for credit accommodations from their banker and from those who furnish them with materials as soon as business begins to return. When that time comes, they will find themselves faced by a new difficulty; their balance sheet and operating statement will show little that will justify credit accommodation.

When the credit analyst examines the management of such a concern, he will have to inquire into the price received for what has been sold, and determine whether this price bears a fair relation to costs. If it is found that the manufacturer has been selling below cost, and that he has orders on hand and quotations out on a non-profit basis, even though he has a fair volume of business, bankers and suppliers are very likely to take the position that he cannot in the near future sell at a profit, and, therefore, is not a good credit risk. Furthermore, many buyers who know that they are buying below cost are carefully watching their business relations with the seller, waiting for the time when he may try to make up for his past losses.

One of the greatest difficulties resulting from cut-price operations will appear when it becomes necessary to reinforce capital that has been used to buy current business. Since it is not possible to obtain business on that basis continuously, bankers may well sound a helpful warning to their manufacturer-customers to the effect that business obtained at a loss is not helpful in establishing necessary banking credits. If the financial interests would discourage cut-throat competition and below-cost selling, it would have a most helpful effect in bringing back sane, constructive competition, and would make those few industries who have not yet resorted to such destructive business methods extremely hesitant about adopting them.

On the other hand, those manufacturers who have maintained a sound and sane price policy through carefully planned management and selling should make it clear to their bankers and to the concerns with whom they do business that they are entitled to real consideration, because they are an asset to their community and their industry.

* * *

Cleveland Conference on Welding

A conference on welding will be held by the Cleveland Engineering Society and the Case School of Applied Science in Cleveland, February 19 and 20. The conference will be held in the Bingham Mechanical Engineering Building of the Case School. All phases of welding practice, including arc welding, thermit welding, and oxy-acetylene welding and cutting, will be dealt with. Practical applications of the welding art in the construction of machinery, pressure vessels, steel structures, and piping systems will be covered by papers presented by well-known engineers in the welding field. There will also be demonstrations and exhibits of welding equipment and welding practice. Program and further information can be obtained from Fred L. Plummer, Case School of Applied Science.

Stabilizing Employment in the Metal Trades

Some of the conclusions reached and recommendations made in the reports of the Industrial Relations Committee of the National Metal Trades Association, with a view to creating such employment conditions as will be most beneficial to the largest number of workers, are as follows:

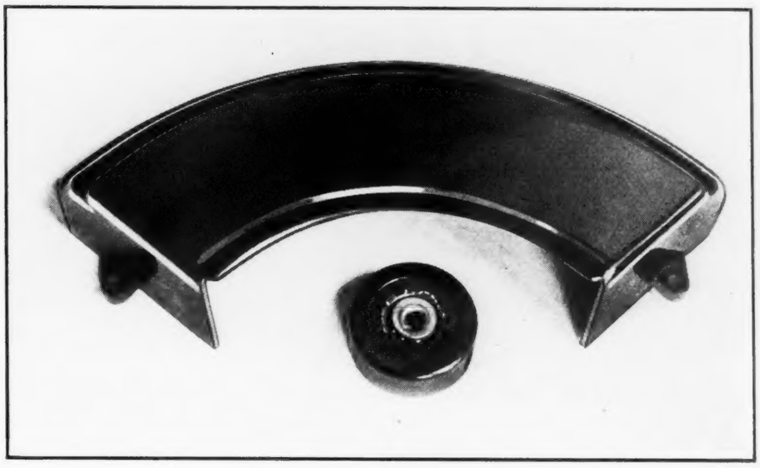
Operate shops on a flexible week basis. By this is meant the practice of so varying the hours of work that variations in production requirements can be met without resorting to variations in the number of employes. Thus when business levels decrease and a reduction in productive effort is necessary, reduce the number of hours per week rather than lay off employes. Similarly, when business increases above normal, do not meet the increase by adding new employes, but instead increase the number of hours worked. Meet any further increase in productive effort by working limited periods of over-time. Only when it becomes evident that additional over-time is impractical should new employes be added to the payroll.

When practical, postpone overhauling, re-arranging, and repairing of machines, equipment, and buildings as much as possible during periods when the sales volume is increasing, thus creating a reservoir of odd jobs on which employes may work when reductions in productive effort must be made.

* * *

New Applications of Molded Synthetic Plastics

The illustration shows two widely different applications of molded synthetic plastics, such as Bakelite or Durez. The large cover which has the appearance of being made from thin sheet metal was molded by the Norton Laboratories, Inc., Lockport, N. Y., from synthetic plastic materials, and is applied to a noiseless typewriter. It has the advantage of fine appearance and lightness. The black color and finish are natural to the material and it is not necessary to put the guard through an enameling process.



Cover for a Noiseless Typewriter and a Roll for the Union Hardware Co.'s Roller Skates, Made from Synthetic Plastic Materials by the Norton Laboratories, Inc.

The illustration also shows a ball-bearing roller-skate roll made from synthetic plastics, with the ball bearing molded directly into the roll. This was also made by the Norton Laboratories for the Union Hardware Co., Torrington, Conn. It is stated that these rolls have been found very suitable for rink use. They make less noise and have a longer life than steel rolls, and have proved superior to fiber rolls. The examples given show the wide uses to which synthetic plastic materials are now being put, their application broadening from day to day.

* * *

A Practical Application of Rehabilitation

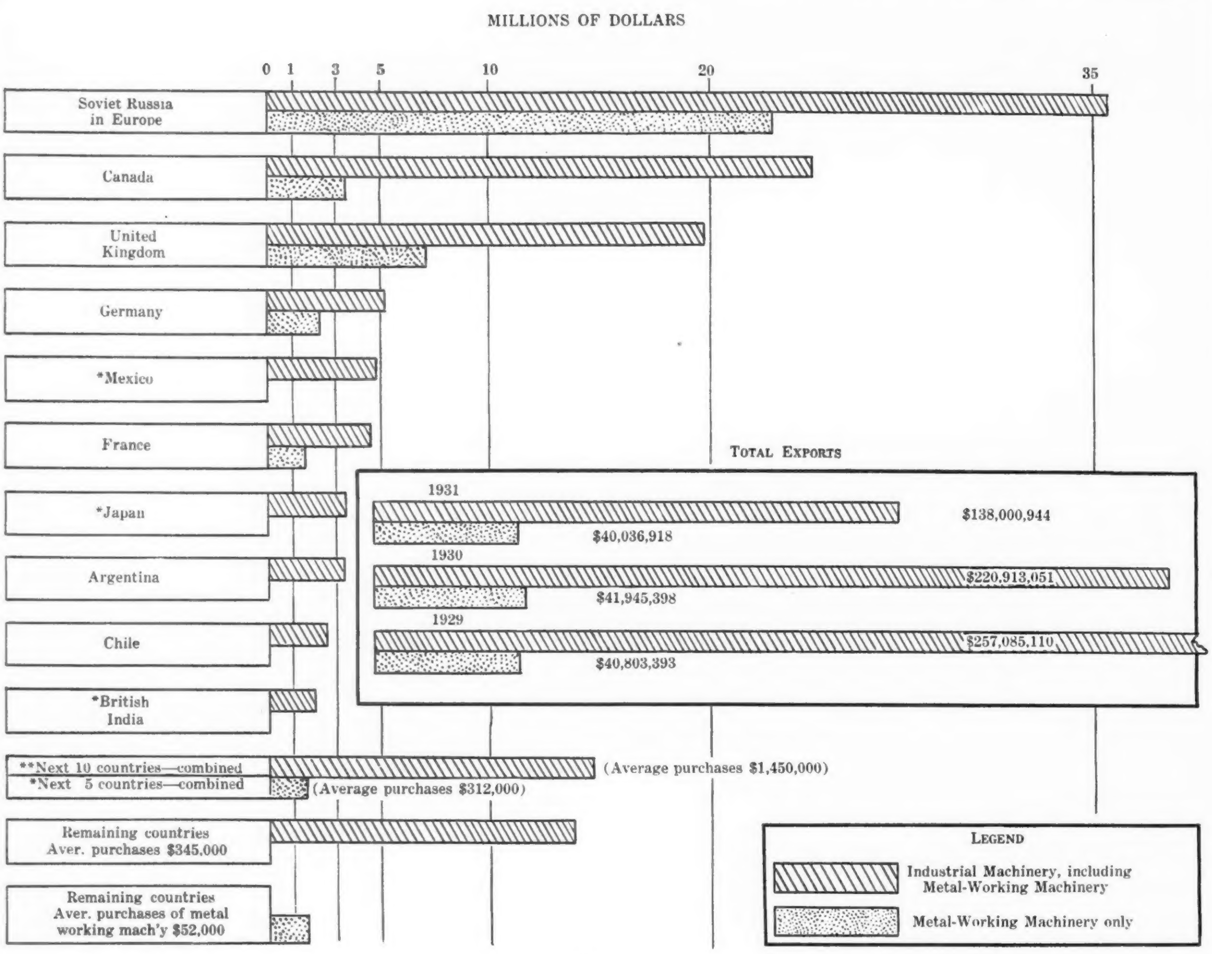
The Carrier Mfg. Corporation of Newark, N. J., recently wrote to the Warner & Swasey Co., Cleveland, Ohio, as follows: "We have one of your old turret lathes which must be replaced, but the present volume of our production will only partially justify a new machine, on an investment basis, at this time. However, we believe that the National Rehabilitation Plan will put men to work if industry will support it with action. Our purchase order No. 12070 is therefore enclosed. It is a condition of this order that you will manufacture this machine or its equivalent in order to get men back to work."

Commenting on this letter, the Warner & Swasey Co. says: "Carrier believe their business has a future and they genuinely endorse the National Rehabilitation Plan. This letter is evidence of Carrier's action toward 'putting men back to work.' They have obtained both an advantage to themselves and moved toward a solution of the national problem of the moment."

* * *

Today, progress is being restrained because we are still living in the past. Every remedy applied is for the purpose of preserving or recalling those phases of the recent boom which are as obviously unsuited to the present as anything can be. Very few fundamental measures are being publicly applied at present, because conflicting interests—political, industrial, financial—are determined to hang on to the old status.—*Charles Benedict in the Magazine of Wall Street*

DISTRIBUTION OF UNITED STATES INDUSTRIAL MACHINERY EXPORTS IN 1931



*Countries buying between $200,000 and $500,000 worth of Metal Working Machinery, in order of importance—Italy, Japan, British India, Sweden, Mexico.

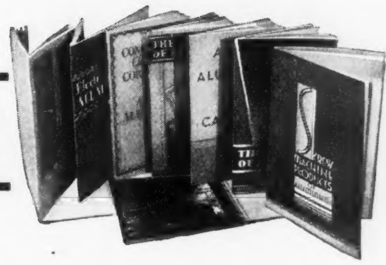
**In order of importance (Industrial Machinery)—Philippine Islands, British So. Africa, Netherland W. Indies, Venezuela, Colombia Cuba, Italy, Brazil, Netherland E. Indies, China.

Source: Commerce Reports, U. S. Department of Commerce.

Research Department, MACHINERY

Cutting Steel Under Water

The story of how steel is cut under water by a burning flame that the surrounding water cannot extinguish might well have been included in the unbelievable tales of Sinbad the Sailor; yet, this is being done today on a commercial scale by the use of a torch that maintains its flame when completely submerged. In February MACHINERY, Charles Kandel of the Craftsweld Equipment Corporation, will tell how this under-water torch is used and how it was developed by Commander Ellsberg for the salvaging of the Submarine S-51 that sank off Block Island seven years ago. The salvaging of this ship was greatly handicapped because there was no satisfactory means of cutting steel under water. A cutting torch that maintains its flame when submerged at considerable depths made it possible to bring the submarine to the surface and into port. Many examples of how this torch is now used in the peaceful pursuits of industrial endeavor will also be described in this article.

NEW TRADE  LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies Can be Obtained by Writing Directly to the Manufacturer.

RIVET-BOLTS. Dardelet Threadlock Corporation, 120 Broadway, New York City. Bulletin containing reports Nos. 2304 and 2310 made by the Testing Laboratories of Columbia University covering tests to determine the relative displacement under load of various types of joints put together with Dardelet "Rivet-Bolts" and hot-driven rivets. The report includes curves showing the total displacement and permanent set under load of the joints made with "Rivet-Bolts," as compared with hot-driven rivets. Other curves show the relative displacement under load of a joint made between one 3/4-inch plate and two 1/4-inch plates, using three rivets and three "Rivet-Bolts." Comparative costs are also included in the report.

PAINT. New Jersey Zinc Co., 160 Front St., New York City. Booklet containing a summary of a treatise entitled "The Influence of the Reflecting Characteristics of Wall Paints Upon the Intensity and Distribution of Artificial and Natural Illumination," by D. L. Gamble of the company's research division. The attractively printed booklet shows, in clearly prepared charts, the amount of light reflected by walls and ceilings painted in different colors. It also defines some of the more common terms used in the study of lighting problems.

GEARS. Smith & Serrell, Globe Indemnity Bldg., Newark, N. J. Bulletin 71, illustrating, describing, and giving dimensions and horsepower ratings of Waldron silent steel gears. These gears are of the all-metal silent type formerly made by the Flexible Engineering Corporation, New York City, and known as "Double D" silent gears. The line has been improved, made more complete, and renamed "Waldron Silent Steel Gears," being manufactured at the plant of the John Waldron Corporation, New Brunswick, N. J.

PORTABLE TENSILE TESTING MACHINES AND EXTENSOMETERS. Linde Air Products Co. (Unit of Union Carbide & Carbon Corporation) 30 E. 42nd St., New York City. Circular descriptive of the Oxweld portable tensile testing machine for testing the strength of metals and welds. Bulletin descriptive of the Oxweld extensometer for determining the stress or load that can be applied in testing a metal without altering the size or shape.

DIAMOND AND CARBIDE BORING MACHINES. City Machine & Tool Works, East Third and June Sts., Dayton, Ohio. Circular descriptive of the Cimatool diamond and carbide boring machines, which are made in three types—the Duobore for simultaneously boring work from opposite ends; the table-type machine; and the bench size boring machine. The circular shows typical examples of work bored on these machines.

TILTABLE ROTARY TABLES FOR PRECISION BORING MACHINES. Societe Genevoise d'Instruments de Physique, Geneva, Switzerland. (American distributor, R. Y. Ferner Co., 1127 Investment Bldg., Washington, D. C.) Pamphlet 556, descriptive of the tiltable rotary table developed for use on "Sip" precision borers for the accurate drilling and boring of slanting or radial holes in tools or workpieces.

NICKEL CAST IRON. International Nickel Co., Inc., 67 Wall St., New York City. First of a series of data sheets covering composition and service data on industrial applications of nickel cast iron. Sheet No. 1 is intended to serve as a guide in the selection of engineering specifications for nickel and nickel-chromium cast iron. Subsequent sheets will be devoted to specific applications.

STAINLESS CLAD STEEL. Ingersoll Steel & Disc Co. (Division of Borg-Warner Corporation), 310 S. Michigan Ave., Chicago, Ill. Folder describing the composition, method of manufacture, and fabrication of Ingersoll "Stainless Clad" steel, as well as illustrating and listing many applications for this new low-cost corrosion-resisting material.

SPECTROSCOPE. Adam Hilger, Ltd., 98 Kings Road, Camden Road, London, N. W. 1, England. Publication No. 176, illustrating and describing the non-ferrous "Spekker," which is a specialized spectroscope for the rapid determination of metallic elements in non-ferrous metals. The instrument is intended for use in shops and factories.

SHEET-METAL WORKING MACHINES. Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 70-B, illustrating and describing the Niagara line of power rotary shears, which includes circle shears, ring shears, and rotary flangers. Complete specifications are included for the different sizes.

CHAIN DRIVES. Morse Chain Co., Ithaca, N. Y. Bulletin R-51, containing tables of dimensions and list prices of Morse roller chain. The last section of the bulletin contains information on how to design roller-chain drives and gives a convenient table of computation constants.

AUTOMATIC SPEED CONTROL. Reeves Pulley Co., Columbus, Ind. Bulletin T-5645, dealing with automatic variable speed control of all types of production machines in all fields of industry. The bulletin describes in detail the application of both electric and mechanical speed control.

MERCURY ARC RECTIFIERS. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Bulletin C-1907-B, descriptive of mercury arc rectifiers of the sectional type, which provide a means for converting alternating to direct current over a wide range of both voltage and current.

BLAST-CLEANING AND DUST-COLLECTING EQUIPMENT. Pangborn Corporation, Hagerstown, Md. Bulletin 193, entitled "Man, What a Helmet!" descriptive of the new Pangborn "Health Protector" blast helmet for use in blast-cleaning operations.

MAGNESIUM ALLOYS. Dow Chemical Co., Midland, Mich. Circular listing various applications of Dowmetal. Circular dealing with the use of Dowmetal in portable or moving parts or products where light weight and strength are required.

WELDING EQUIPMENT. Lincoln Electric Co., Cleveland, Ohio. Application Sheet No. 32 in a series on the elements of design, descriptive of the application of welding in the design of clevis and pin connections for lever mechanisms.

LAMINATED SYNTHETIC PRODUCTS. Continental-Diamond Fibre Co., Newark, Del. Catalogue describing the properties, manufacture, and uses of Dilecto, a laminated synthetic material. A table of standard grades and sizes is included.

AIR GRINDERS. Madison-Kipp Corporation, 203 Waubesa St., Madison, Wis. Card intended to be hung up in the tool-room, announcing new low prices on the Blue Midget Kipp air grinder and all other models made by this company.

MOTORS. Reliance Electric & Engineering Co., Cleveland, Ohio. Bulletins 114 and 116, containing data on Reliance low-inertia special-torque alternating-current motors, and Type AA motors for flywheel applications, respectively.

MATERIAL-HANDLING EQUIPMENT. Bucyrus-Erie Co., South Milwaukee, Wis. Bulletin L-10, illustrating and describing the Loadmaster crane. The booklet contains illustrations showing nearly fifty applications of this crane.

MOTORS. General Electric Co., Schenectady, N. Y. Bulletin GEA-1191A, covering the GE line of synchronous motors. The construction, operating characteristics, and applications of these motors are described in detail.

WELDING MACHINES. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Leaflet entitled "Arc Welding Data Bulletin No. 16," describing the features, characteristics, and applications of Westinghouse FlexArc welders.

OIL-PUMPS. De Laval Steam Turbine Co., Trenton, N. J. Catalogue L-10, descriptive of the De Laval-IMO oil pump, a rotary-displacement pump designed to run at standard motor speeds and even at turbine speeds.

ELECTRIC MOTORS. Sterling Electric Motors, Inc., Telegraph Road at Atlantic Blvd., Los Angeles, Calif. Bulletin 125, descriptive of the Sterling line of "Slo-Hi" speed electric motors for direct power application.

GRINDING MACHINES. Abrasive Machine Tool Co., East Providence, R. I. Bulletin illustrating and describing the No. 1 1/2 hand-operated surface grinding machine made by this concern for tool-room use.

BENCH LATHES. Hardinge Bros., Inc., Elmira, N. Y. Circular illustrating and describing the Cataract six-speed motor drive unit, which constitutes a radical change in conventional bench-lathe drives.

ZINC PRODUCTS. New Jersey Zinc Co., 160 Front St., New York City. Bulletin containing an article entitled "Zinc: New Uses for an Old Metal," reprinted from the *Review of Reviews and World's Work.*

STAINLESS STEEL. Electro Metallurgical Co., 30 E. 42nd St., New York City. Booklet entitled "Stainless Steels and Their Uses," outlining three hundred different uses for chromium alloy steels.

LEATHER BELTING. E. F. Houghton & Co., Philadelphia, Pa. Catalogue descriptive of the construction, advantages, and applications of "Vim Tred" leather belting—a belt with a non-skid surface.

MONEL METAL AND NICKEL ALLOYS. International Nickel Co., Inc., 67 Wall St., New York City. Bulletin T-5, containing information on the engineering properties of Monel metal.

STEEL OFFICE AND SHOP EQUIPMENT. Standard Pressed Steel Co., Box 22, Jenkintown, Pa. Bulletin listing the line of "Hallowell" welded-steel stools, chairs, and tables.

REBUILT MACHINE TOOLS. Eastern Machinery Co., 3267 Spring Grove Ave., Cincinnati, Ohio. Machinery List No. 33 of rebuilt machine tools carried in stock by this concern.

WELDED ROLLED-STEEL CONSTRUCTION. Whitehead & Kales, Detroit, Mich. Circular showing examples of typical machine parts made of arc-welded rolled-steel construction.

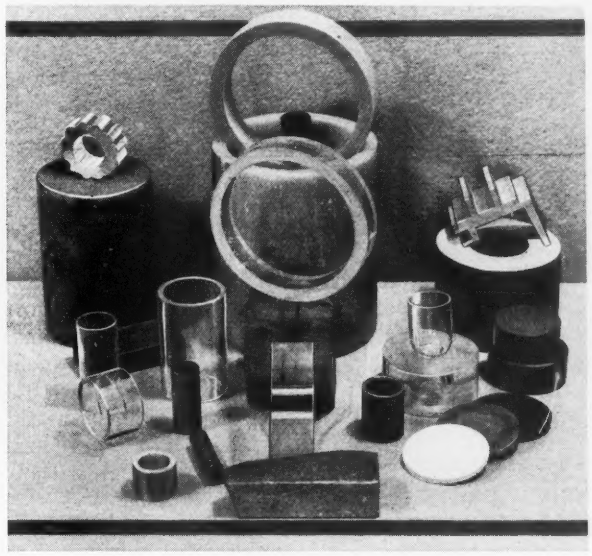
HEAT-TREATING FURNACES. Hevi Duty Electric Co., Milwaukee, Wis. Bulletin 1132, describing the new Hevi-Duty "Atmosphere Control" tool-room furnaces.

MOTORS. Lincoln Electric Co., Cleveland, Ohio. Bulletin entitled "That Motor with the Extra Horsepower," descriptive of the Linc-Weld Type D motor.

Torch-Hardening of Gear Teeth

How the teeth of large gears can be hardened by heating them with an oxy-acetylene torch and immediately cooling them with water-quenching jets will be described in an article in February MACHINERY, by Norman E. Woldman, metallurgical engineer of the Nuttall Works of the Westinghouse Electric & Mfg. Co. This new process for localized heat-treatment of gear teeth has proved very successful in cases where it is of importance not to subject the whole gear to the distortion resulting from quenching at a high temperature. The method is known to the trade as the Nuttall "E. P." heat-treating process. By means of this process, a gear can be finish-machined to size and then heat-treated without any distortion of the gear itself, and with little or no distortion of the gear teeth.

Shop Equipment News

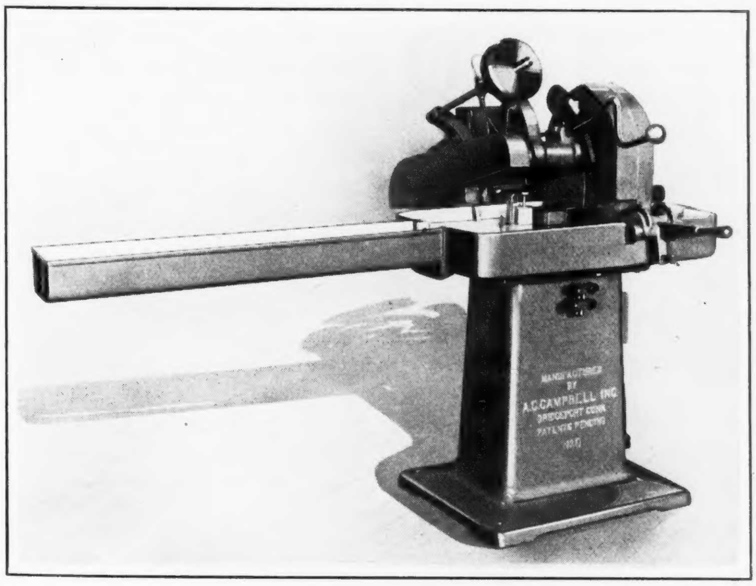


Machine Tools, Unit Mechanisms, Machine Parts and Material-Handling Appliances Recently Placed on the Market

Campbell Wet Cutting-Off Machine

An exhibit that attracted considerable attention at the Power Show recently held in New York City was a high-speed machine cutting off hardened steels, tool steel, glass tubing, stainless steel, synthetic plastics, and stone. This machine is a product of Andrew C. Campbell, Inc., Bridgeport, Conn. Although the machine was used for cutting hard materials in the demonstration, it is fully as suitable for cutting other materials.

The cutting is done by a rubber-bond abrasive wheel or disk only about 1/16 inch thick, which revolves at a speed of 1800 revolutions per minute. The maximum wheel diameter is 16 inches. The work is submerged in a coolant, and thus all tendency to burn the work is eliminated.



High-speed Machine Designed for Cutting off Stock Submerged in a Solution

The machine gives a clean, smooth cut without glazing, burning, or burring, and the pieces cut off usually do not require further machining on the ends. Disks as thin as 0.110 inch have been cut from rods of phenolic material. It is claimed that the thickness can be held to within limits of 0.001 inch.

Two sizes of the machine are at present available, with capacities of 1 and 2 horsepower. The maximum diameter of stock that can be accommodated is 3 inches. The wheel-spindle is mounted on the front end of a pivoted arm, and the motor that drives it on the opposite end. Power is delivered through a double V-type belt.

The downward movement of the cutting-off wheel is controlled partly by the position of an adjustable counterweight and partly by an oil dashpot. The dashpot is within the base and

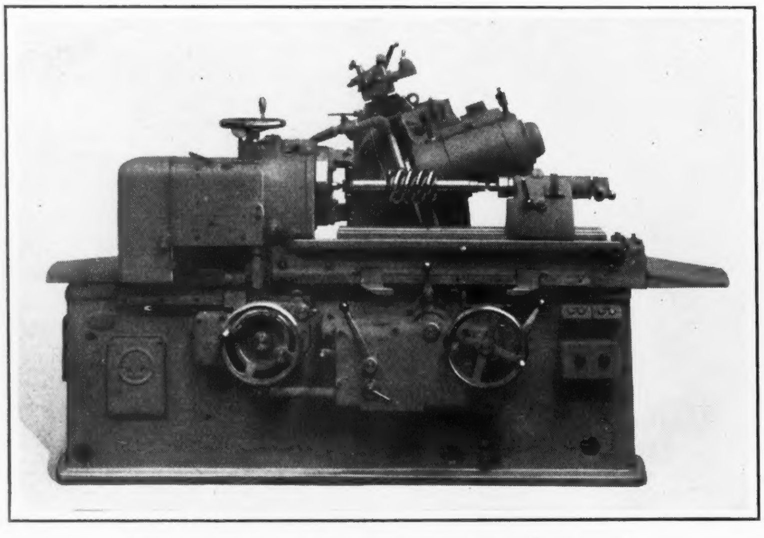
is engaged by the lower end of a plunger that moves downward with the arm of the machine during a cut. An adjustable outlet orifice on the dashpot controls the rate at which the arm is lowered. When the cut is completed, the operator is informed of the fact by the lighting of an electric lamp.

Automatic Worm-Grinding Machine

Worms of single or multiple threads, of right- or left-hand lead, and in a soft or hardened condition, can be automatically ground on the flanks in a Reinecker worm-grinder, which is being introduced on the market by the George Scherr Co., Inc., 128 Lafayette St., New York City. A grinding wheel with a double bevel grinds both flanks at the same time, except in the case of very heavy pitches.

After the grinding wheel has passed through the thread, the table feed tarries an instant to allow the wheel to recede and clear the work. This motion is obtained hydraulically with a cushion-like effect. The table then returns rapidly to the starting position, where the wheel again enters the thread. This cycle is repeated until the worm is finished. The feed of the grinding wheel can be accomplished by hand or automatically through hydraulic equipment. The automatic feed can be set to from 0.0001 to 0.002 inch.

In grinding multiple-thread worms, use is made of an automatic indexing mechanism. The indexing takes place during the rapid return movement of the table. Worms with leads from 1/8 to 25 inches and of a diameter up to 10 1/2 inches can be ground in this machine. The maximum length that can be ground without resetting is 24 inches.

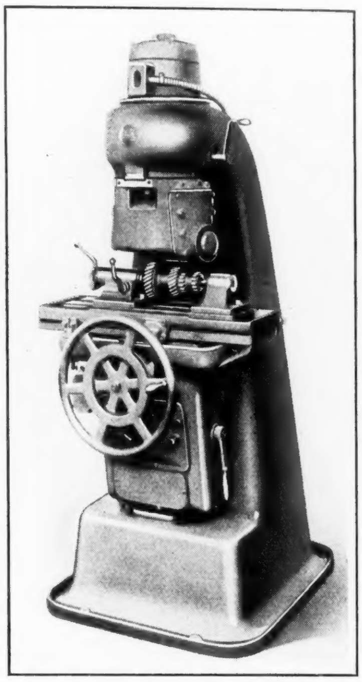


Worm-grinder with Automatic Index-head and Hydraulic Wheel Feed

"Auto Bloc" High-Speed Chain Hoist

A new line of high-speed chain hoists equipped with either Timken tapered roller bearings or ball bearings at every bearing surface is being introduced on the market by David Round & Son, Cleveland, Ohio. Compactness and light weight are the advantages claimed for these hoists. Another feature is the large number of gear teeth in mesh at all times.

These hoists are regularly manufactured in thirteen sizes having capacities ranging from 1/2 to 20 tons. The two-ton hoist weighs only 130 pounds.



Gear-finishing Machine in which the Cutter is a Helical Gear

"Red Ring" Gear-Finishing Machine

In a gear-finishing machine recently designed by the National Broach & Machine Co., Shoemaker and St. Jean Sts., Detroit, Mich., for increasing the accuracy of gears with a view to reducing their noise in service, the cutting tool is a helical gear made of an alloy steel. This tool is gashed or slotted at one or more points along its face and the actual cutting is done by the acute cutting edges at each side of the slot. The cutting is accomplished by traversing the work axially while in contact with the revolving cutter. The machine cuts at an angle with the axis of the gear and generates the shape of each tooth in the same direction as that taken by the teeth of two mating gears sliding over each other.

The cutter-head is adjustable about its vertical axis to bring the cutting-tool arbor into the desired angular relation with the work-arbor. The table has a longitudinal reciprocating movement and a vertical feed. Both movements are automatic. With

each reversal of the table, the cutter rotation is also reversed. In this way, both faces of each gear tooth are subjected to the cutting action. Upon the completion of each cycle, the table is fed upward, and at the end of any predetermined number of cycles, the machine stops automatically.

It is claimed that the profiles of gear teeth processed in this machine are correct to within plus 0.002 inch of a true involute curve. The tooth spacing, eccentricity, and helical angle of the gear are also corrected, and each tooth surface is made smooth and bright.

Cataract Six-Speed Motor Drive Unit

Six forward and six reverse speeds are provided by a motor drive unit brought out by Hardinge Bros., Inc., Elmira, N. Y., for application to bench lathes, hand screw machines, and milling machines. The unit is intended to eliminate gears and clutches in driving machines of this class, substituting endless belts. The absence of noise, chatter, and vibration is the advantage claimed.

Power is provided by a standard two-speed reversible motor. The speed changes are controlled through patented self-locking foot-treadles.

Brazing Process for Cemented-Carbide Tools

Thomas Prosser & Son, 15 Gold St., New York City, and 1050 Mt. Elliott Ave., Detroit, Mich., announce the development of the Z-Foil Process for brazing cemented-carbide tips of various kinds to steel shanks. It is claimed that this patented process produces an unusually strong bond between the cemented carbide and the steel shank, so that tools brazed in this way can be used for severe service without the tips coming off or slipping.

Another advantage of the process is that dovetailing of the tip is unnecessary, so that tools intended for cutting in several directions can be designed without steel backing or dovetailing. Extra hard or tough shanks can be used with the cemented-carbide tips.

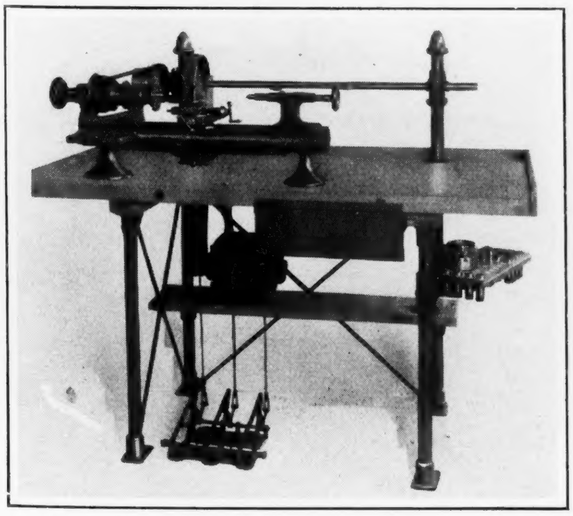
Producto-Matic with Vertical and Horizontal Feeds

A No. 120 Producto-Matic milling machine has recently been developed by the Producto Machine Co., Bridgeport, Conn., in which the cutter-heads have an automatic vertical feed and the table an automatic longitudinal feed. These two movements can be used in various ways.

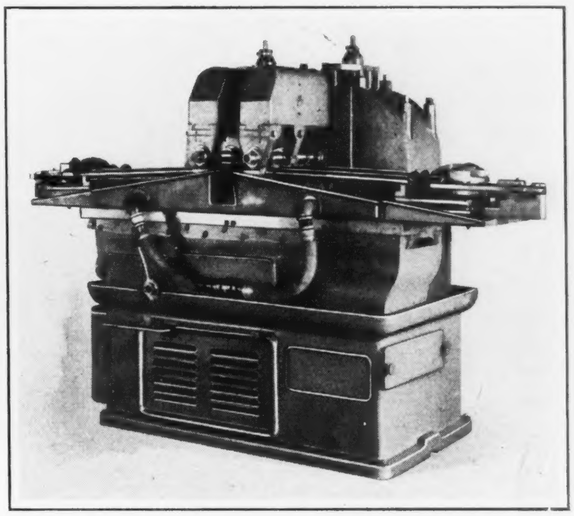
Generally, the cutter-heads travel vertically until the cutters are fed to the desired depth and then the table travels longitudinally to finish the operation, the cutters remaining in one position. However, the cutters can be arranged to leave the work at any desired point and to return again, as when two keyways are to be milled in the same shaft. The machine has been used for milling keyways in automobile rear-axle and propeller shafts and in the armature shafts of electric motors. In these parts, the keyways do not extend to the shaft ends. The illustration shows the set-up for rear-axle shafts.

By feeding the cutters vertically at the same time that the table is fed longitudinally, it is possible to take cuts at any desired angle. Cuts can also be taken at various radii. Hence the machine is adaptable for a large variety of work.

The model illustrated is equipped with two columns and two cutter-heads, so that the operator can reload parts on one end of the table while another group on the opposite end is being milled. Three or four columns and cutter-heads can be provided if required. With two columns and two cutter-heads, and without the fixture, this machine weighs approximately 9000 pounds.

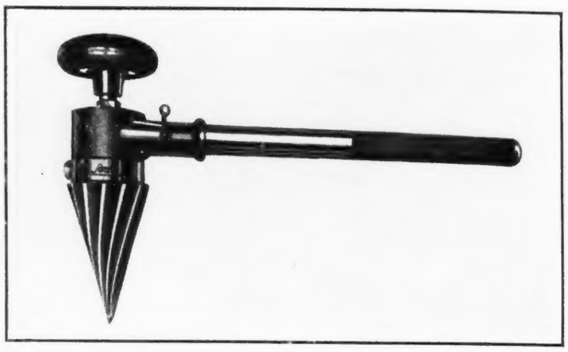


Motor Drive Unit which Provides Six Forward and Six Reverse Speeds



Producto-Matic Arranged for Milling Keyways in Four Shafts at One Time

Blue Midget Grinder, the Latest Addition to the Line of Madison-Kipp Air-driven Tools



Greenfield Ratchet Type of Reamer Designed for Quickly Removing Burrs from Pipe

Blue Midget Kipp Air Grinder

The Madison-Kipp Corporation, 203 Waubesa St., Madison, Wis., announces a Blue Midget air grinder "priced so low that every mechanic can have one at his bench." The new grinder operates at a speed of 40,000 revolutions per minute. All Kipp air tool accessories and wheels having 1/8-inch diameter shanks can be used on this grinder. The maximum diameter of wheel is 7/8 inch. This grinder is recommended for all light work and intermittent service.

Thor Drill and Reamer with Offset Motor

An electric drill and reamer with an offset motor that is separate from the frame and feed-screw post has been placed on the market by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This machine is of a short rugged design that permits the use of a feed of large range and a short spindle that facilitates using the equipment in close quarters.

The switch handle is of the safety roll type, which cannot be operated except by a turn of the operator's hand. It closes automatically when the hand is removed from the grip. This equipment is made in five sizes, with drilling capacities ranging from 7/8 to 1 3/4 inches, and reaming capacities ranging from 11/16 to 1 1/8 inches.

Greenfield Ratchet Burring Reamer

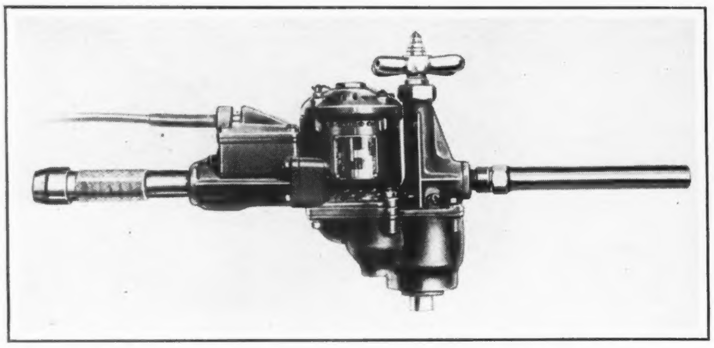
A cone-shaped reamer for removing burrs quickly from the inside of pipe has been added to the line of tools produced by the Greenfield Tap & Die Corporation, Greenfield, Mass. This No. 246-R reamer has spiral flutes which give it a shearing action and, at the same time, feed it into the burrs so that a heavy pressure need not be applied on the stock. The reamer is operated by means of a completely enclosed ratchet head.

While the tool is designed primarily for removing burrs from pipe up to 2 inches, it can also be employed for enlarging holes in sheet metal, for countersinking, and for various other purposes.

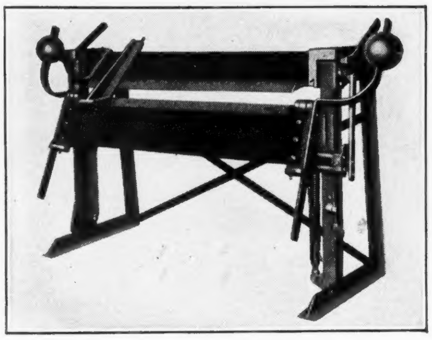
Whitney Metal Bending Brake

A metal brake in which the material being bent is held against a stationary member or platen has been brought out by the Whitney Metal Tool Co., 110-114 Forbes St., Rockford, Ill. This operating principle is just the reverse of that employed on the conventional type of bending brake. The machine is especially suitable for making square corners, and there is provision for quickly converting it into a box- or pan-making brake.

Two coil springs balance the weight of the mechanism so that



Thor Electric Drill and Reamer with the Motor Offset from the Spindle



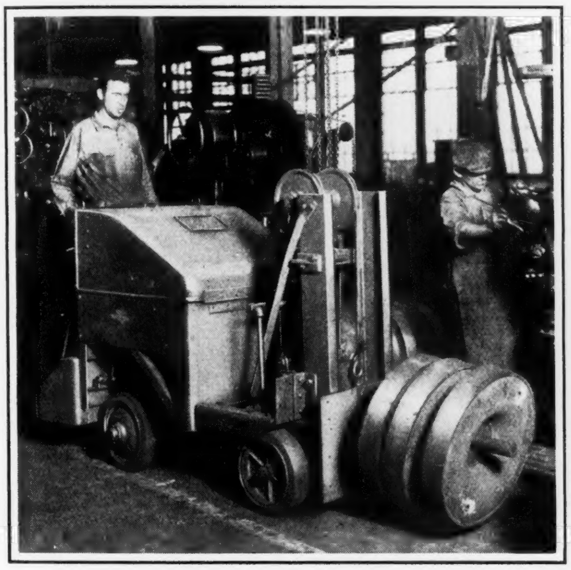
Whitney Metal Brake for Bending and for Making Boxes or Pans

the operator does not need to do any lifting. Material up to and including No. 16 gage can be accommodated.

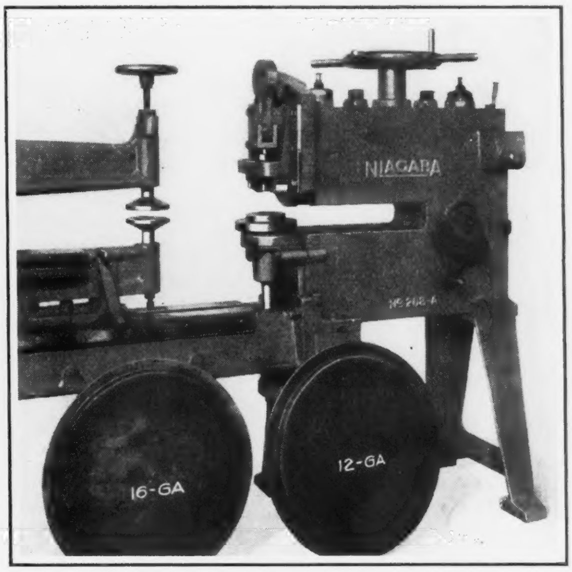
Clark "Tructier" Ram

The standard tiering "Truclift" chassis of two- and three-ton work-handling equipment built by the Clark Tructractor Co., Battle Creek, Mich., may now be equipped with a ram especially suited for lifting, carrying, and tiering coiled strip steel and wire, heavy wheels, dies, tires, machine parts, and other heavy loads of awkward shape.

The illustration shows a "Truclift" equipped with this ram. The ram is 3 inches in diameter and has a standard length of 30 inches. Loads up to 4000 pounds can be carried by the ram of two-ton "Truclifts," provided the center of the load is not more than 15 inches from the plate.



"Truclift" Fitted with a Ram for the Convenient Handling of Certain Classes of Work



Rotary Flanging Machine Equipped for Producing Flanged and Recessed Tank Heads

"Vim Tred" Leather Belting

Leather belting with a grooved driving surface that makes it "non-skidding" has been developed by E. F. Houghton & Co., 240 W. Somerset St., Philadelphia, Pa. The tread is indented into the driving surface. Among the advantages claimed for this belting are high pulling power, unusually smooth operation, and freedom from slippage. While the unit pressure between the pulley and the belt is said to be greater than with ordinary flat leather belting, the total tension in the belt is not increased. This belt is recommended for short-center drives, as well as for medium or long drives.

Rolls for Producing Flanged and Recessed Heads

Special flanging rolls designed for use on the line of rotary shears and flangers manufactured by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y., enable standard type round recessed heads, flanged for double seaming, to be produced on these machines. Heads of this type in various diameters are used in the manufacture of drums, containers, tanks, etc., of double-seam construction.

The machine, equipped with standard cutters, is used first to cut the flat circular blank. Then the cutters are replaced by the flanging attachment, equipped with the special rolls, for completing the head in a second operation. One set of rolls will produce heads over a large diameter range by a simple adjustment of the position of the circle arm. For each variation in depth of chime, a separate lower flanging roll is required.

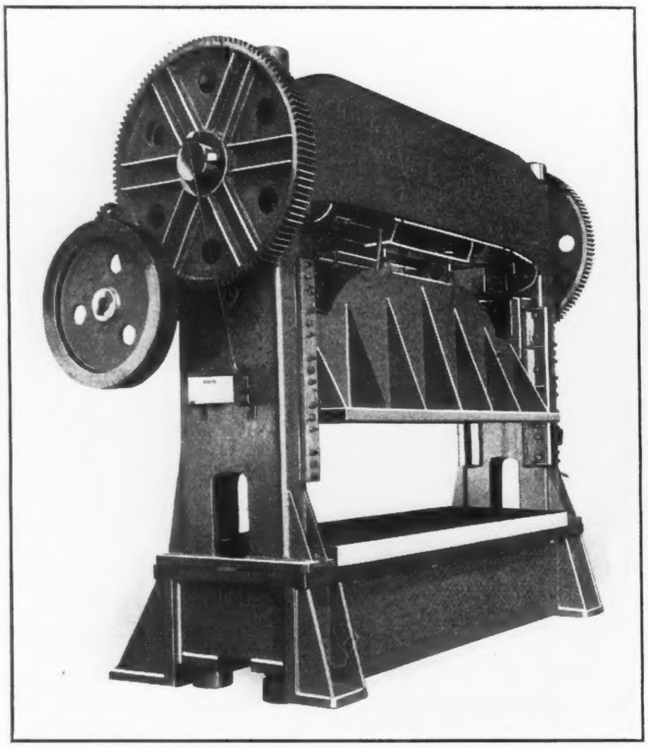
Leiman Rotary Air Pumps

Rotary air pumps of various sizes designed for a wide range of applications requiring air pressure or a vacuum have been developed by Leiman Bros., Inc., 23 Walker St., New York City. These pumps can be used for operating different types of gas and oil burning appliances, blowpipes, furnaces, etc. They are also suitable for agitating plating solutions and for operating all sorts of automatic devices, as on wrapping and packaging machines. They can also be used as air motors for driving various types of equipment.

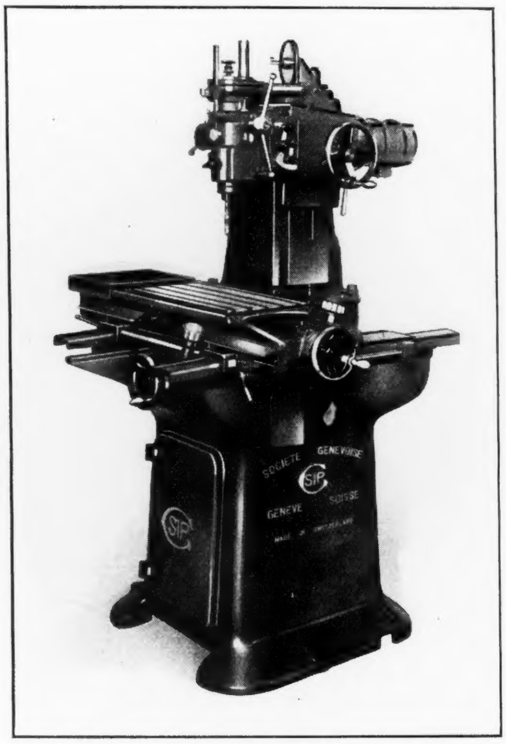
These pumps are manufactured in sizes ranging in capacity from 1 ounce to 80 pounds pressure per square inch and from 1 inch of mercury vacuum up to practically a perfect vacuum of 30 inches.

Verson All-Steel Straight-Sided Double-Crank Press

A welded steel-plate press of the straight-side, double-crank type, having a capacity of 350 tons and a bed area of 48 by 140 inches, has recently been built by the Allsteel Press Co., Inc., 12015 S. Peoria St., Chicago, Ill. The stroke is 10 inches, the shut height 20 inches, the over-all height 154 inches, and the weight 100,000 pounds. The floor space occupied is 7 by 16 feet.



Welded Steel-plate Double-crank Press of 350 Tons Capacity



Swiss Jig Borer Suitable for Light Manufacturing

The press is double-geared. Two balance wheels are provided, one on each end of the high-speed back shaft. The frame is of four-piece, tie-rod construction. The bed is built flush with the floor, no pit being necessary. The plates that comprise the uprights are bent at the corners and welded centrally.

The clutch is of the multiple-disk friction type, and is operated by a hand and foot air trip. The ram is adjusted by means of a reversing motor equipped with a push-button control. The brake is self-releasing. Lubrication of the press is obtained through two force-feed units.

Special Electric Bench Grinder

The Black & Decker Mfg. Co. and the Van Dorn Electric Tool Co., Towson, Md., have brought out a 6-inch special electric grinder for all types of bench grinding, tool sharpening, etc. This machine is equipped with bronze sleeve bearings, whereas the standard grinder is fully equipped with ball bearings, the new machine having been designed with a view to giving high-quality service at a low investment.

The grinder is furnished with two wheels 1/2 inch wide, one coarse and one fine. There are adjustable tool-rests and adjustable wheel guards.

Swiss Jig-Boring Machine of Single-Column Design

A single-column type of jig-boring machine with a range of speeds, power, and capacity that adapts it to a large variety of light manufacturing jobs has been placed on the market by the Societe Genevoise d'Instruments de Physique, Geneva, Switzerland, through its agent, the R. Y. Ferner Co., 1127 Investment Bldg., Washington, D. C. The machine can be used in making parts of a first model, in tooling up for the model, in making synthetic-plastic and die-casting molds, etc. It is also particularly useful in the manufacture of watches, clocks, typewriters, computing machines, sewing machines, and other products made up of small parts. Holes up to 0.6 inch can be drilled in cast iron, or up to 1/2 inch in steel. Holes up to 1.6 inches can be bored.

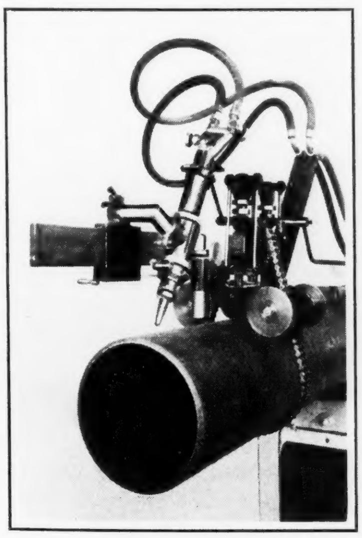
The work-table of this machine, which is designated the MP-2C, is supported on flat ways

on the bed. The table can be moved both transversely and longitudinally. It is aligned with the bed by means of a guiding frame. The main advantage claimed for this method of supporting the table is that excess overhang in the extreme positions is eliminated.

The boring head and motor, together with a six-speed gear-box, are mounted on a vertical slide on the column. Both a power feed and quick hand feed are provided for the spindle. A feature of the boring head is a depth-of-hole measuring device. There is also a dial indicator for centering the spindle in a hole, aligning the work, centering the spindle on the circular table, centering the work on the circular table, and measuring or checking work.

Portable Pipe Cutting and Beveling Machine

A portable machine for cutting off pipe and beveling it ready for welding has been placed on the market by the Air Reduction Sales Co., Lincoln Bldg., 42nd St. opposite Grand Central, New York City. This equipment, as illustrated, comprises a light four-wheel carriage on which a crank-driven sprocket and torch-supporting bracket are mounted. The carriage is held on the pipe by a roller chain which engages the sprocket. By turning the sprocket with the hand-crank, sufficient friction is developed to rotate the pipe, when the latter is free to turn, or to rotate the machine around the pipe, when the pipe is fixed.

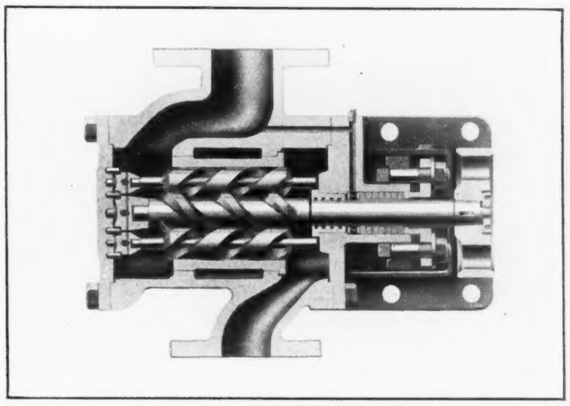


Airco Equipment for Cutting off and Beveling Pipe

The cutting torch is adjustable to any angle from the vertical to 45 degrees. It can also be adjusted laterally to produce a lead cutting angle. The chain is furnished in separable sections covering pipe sizes from 4 to 12 inches in diameter.

De Laval-IMO Rotary Displacement Pumps

Rotary displacement pumps capable of running at speeds usually considered impracticable for pumps of this type have been developed by the De Laval Steam Turbine Co., Trenton, N. J. In the machine tool field, these pumps can be used for the hydraulic operation of broaching machines, presses, planers, shapers, and other equipment. In such installations, one pump is used as a hydraulic motor in combination with a unit used as a pump, this arrangement giving a variable-delivery outfit. The pumps can also be used for supplying fuel oil to burners and for delivering lubricating oil.



Rotary Displacement Pump Suitable for Machine Tool Feeds and for Delivering Oil

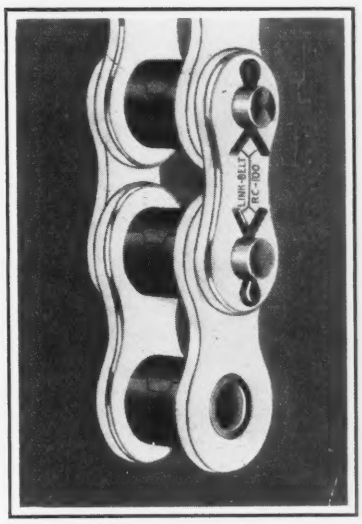
Power is applied to the central or power rotor seen in the illustration, which meshes with one or more sealing rotors of such form that they are propelled largely by fluid pressure with a minimum of mechanical contact. The threads of the power rotor are convex, while those of the idler rotors are concave.

These pumps are regularly available in capacities ranging from 1/2 to 700 gallons per minute, and for pressures up to 500 pounds per square inch. Pumps for higher pressures and capacities can also be supplied.

Link-Belt "Silverlink" Roller Chain

A roller chain having rolled alloy-steel side bars, treated to resist corrosion, is being placed on the market by the Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., under the trade name of "Silverlink." This trade name has been chosen, because the treatment gives the side bars the appearance of being made from silver.

The new roller chain is made in all pitches from 3/8 to 2 1/2



"Silverlink" Roller Chain Having Corrosion-resisting Side Links

inches, and in single or multiple widths. It is available with sprocket wheels for any horsepower, and also with a wide variety of conveying attachment links. Complete drives are carried in stock by distributors in sizes up to 225 horsepower and in speed ratios of from 1 to 1 up to 8 to 1.

Carboloy Tool Kit

A tool manufacturing kit intended to enable job shops and small manufacturing plants to use cemented-carbide tools more extensively has been placed on the market by the Carboloy Company, Inc., 2487 E. Grand Blvd., Detroit, Mich. As illustrated, the standard kit contains brazing and cleaning materials and an assortment of Carboloy tips and shanks for making four tools 3/8 inch square by 2 1/2 inches long, 1/2 inch square by 3 1/2 inches long, 5/8 inch square by 4 inches long, and 5/8 inch wide by 1 1/4 inches high by 8 inches long. The shanks are recessed to receive tips for either right- or left-hand use. In addition to these sizes, shanks and tips can be supplied to fit special requirements.

Kit of Carboloy Bits and Steel Shanks Intended Primarily for Job Shops and Small Plants

Olsen Hydraulic Universal Testing Machines

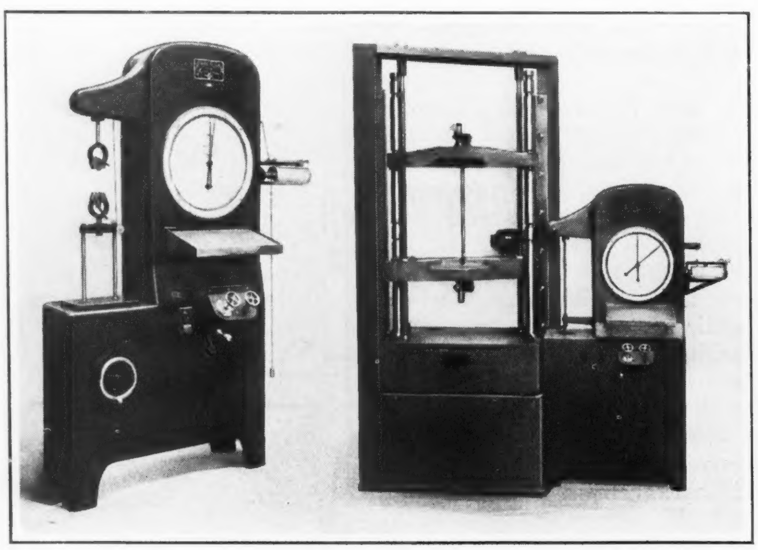
A new line of hydraulic universal testing machines is being built by the Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa., equipped with a self-indicating pendulum dial, lever weighing system, and a No. 3 recorder. The Olsen-Smith high-magnification autographic attachment may also be supplied. The machines are intended for testing specimens for tensile strength, compressive strength, and transverse strength, and for determining the modulus of elasticity and proportional limit. If desired, the machines can be arranged for applying the load mechanically instead of hydraulically. They have an independent weighing system.

The hydraulic loading system is designed to provide a constant speed of testing. One valve can be set for any predetermined speed and variations in speed from that point can then be obtained by using a second valve. Tests can be conducted at a constant cross-head motion, and specimens can be loaded at a specified number of pounds per minute. After the specimen is ruptured, the pulling head returns automatically to its initial position, ready for the next test. This feature makes the machines suitable for production testing. The pointer of the pendulum dial makes two revolutions, so that the dial is equivalent to one twice the diameter.

The machine illustrated at the left is intended especially for testing fine wire, strip steel, etc. It is built in five capacities, the maximum being 5000 pounds. Dual capacity is usually furnished, but triple or quadruple capacity can be secured. Various lengths of specimens up to 10 inches can be tested in this machine. The pulling head has a travel of 4 inches.

The equipment shown at the right is designed for handling large bulky specimens up to approximately 5 feet long, and has a clearance between the straining scales of approximately 36 inches. This machine is built in various capacities from 50,000 to 400,000 pounds. The adjustment of the lower cross-head is secured by a fast-speed motor drive. This drive has two important functions—first, to quickly adjust the lower head, and second, to move and place the lower cross-head in one of its three positions. The lower cross-head is guided independently of the weighing system by means of rigid steel columns tied together at the top to prevent lateral motion. The hydraulic loading system has a total travel of 6 inches.

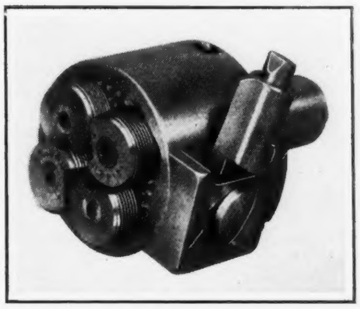
In the two machines illustrated, a special method is used for changing the capacity that



Two Hydraulic Universal Testing Machines Just Developed by the Tinius Olsen Testing Machine Co.

does not require the removal of any weights from the pendulum on a dual-capacity type. All that is required is to change a plug from one station to another. Machines of other capacity and the same general type, have minor differences in construction, but operate on the same principle.

Circular-Chaser Self-Opening Die for B & S Machines



Circular-chaser Die for Brown & Sharpe Automatic Screw Machines

A self-opening die with Type DBS circular chasers, made to fit Brown & Sharpe automatic screw machines, is being introduced to the trade by the National Acme Co., 170 E. 131st St., Cleveland, Ohio. Long chaser life and the production of a thread profile and thread finish of high quality are advantages claimed for these chasers. The large amount of metal behind the cutting edges permits maximum cutting speeds, because the heat created in a thread cutting operation is readily distributed.

The die is automatically closed just before the threading operation starts. Possible variation in the tool-slide travel due to cam wear is compensated for by a provision in the shank. The minimum cutting diameter is 0.056 inch. Chasers are available with the thread either milled or ground. Ground thread chasers can be furnished to cut threads as fine as 80 per inch. Movable parts are hardened and ground.

Morton Boring, Drilling, Milling and Planing Machine

Horizontal boring, drilling, and milling, vertical milling, right-angle boring, shaping, planing, and slotting can all be performed on the combination boring, drilling, and milling machine and draw-cut traveling-head planer here illustrated, which was recently built by the Morton Mfg. Co., Muskegon Heights, Mich. This machine has a cutting stroke of 48 inches and a bed 14 feet long. Nine feet of horizontal feed are available, and 48 inches of vertical feed on the column. However, the length of these feeds and the stroke can be made to suit requirements.

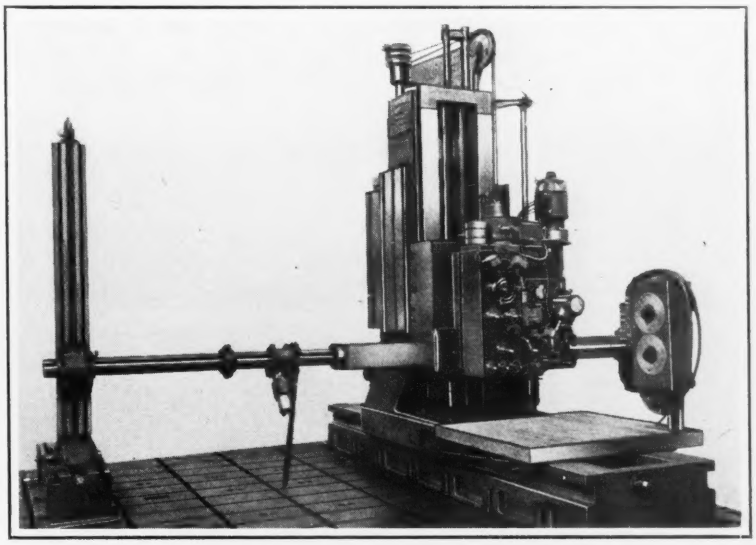
The illustration shows the machine with a boring-bar and outer support for the boring-bar. The outer support has 30 inches of horizontal feed and 60 inches of vertical feed, both of which are hand-operated.

An improved gear-box gives thirty feed changes for boring and milling. The milling feeds can be quickly changed in either direction. A wide range of boring and milling speeds is obtained through a gear-box at the end of the ram. Both the horizontal and vertical feeds can be intermittent or continuous.

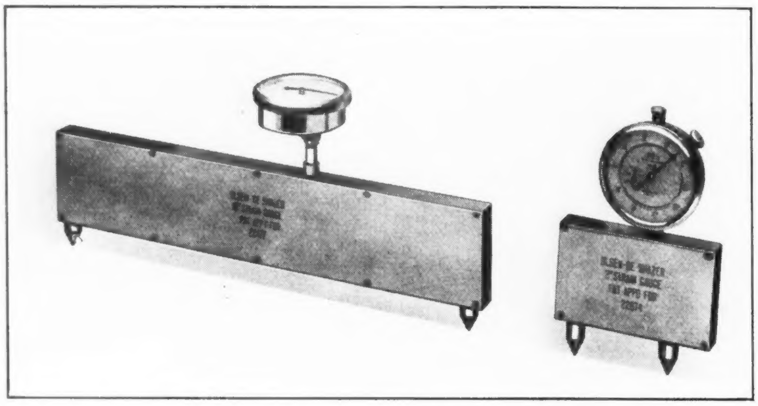
The job of changing over from boring or milling to planing or slotting can be accomplished within one minute. A rapid power traverse is provided in all directions. The ram is reciprocated by a reversing motor drive of not less than 10 horsepower. Power for boring and milling comes from the same motor. The weight of this machine, including the attachments, is about 44,000 pounds.

The Morton Mfg. Co. has also just produced a draw-cut type of machine designed especially for trimming the flash from butt-welded seams of steel barrels, grease drums, and other cylindrical parts. This machine follows the general design of other flash-trimmers produced by the concern (described in July, August, and December MACHINERY). It has a cutting stroke of 40 inches.

As in the case of the model shown in the December number, air is not used in the operation of the latest machine. When a hand or foot push-button is operated, the work is clamped automatically and the rams are started on the inward or draw-cut stroke during which the trimming is performed.



Morton Horizontal Boring, Drilling, and Milling Machine and Draw-cut Traveling-head Planer



Strain Gage in which the Points Move Parallel Relative to Each Other

Olsen-De Shazer Strain Gage

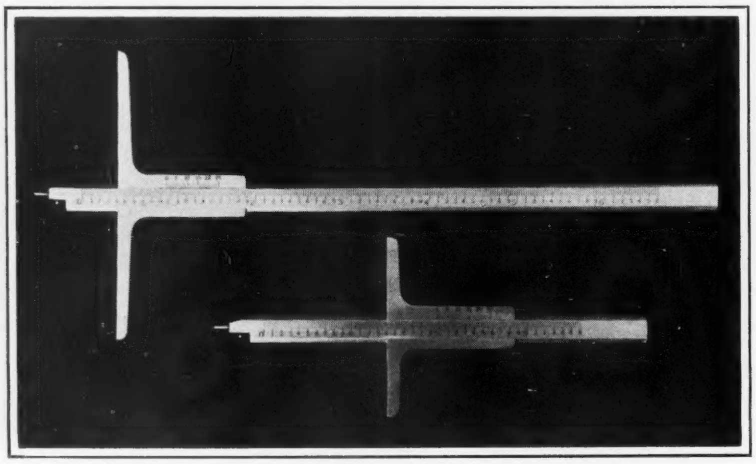
A strain gage designed for stress investigations requiring instruments in which the relative movement of the gage points is always parallel, is being placed on the market by the Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa. In this Olsen-De Shazer strain gage, the motion of the points is transmitted through levers and a plate fulcrum system to a dial indicator. Either a horizontal or vertical indicator, or both, can be furnished.

The main lever system of this strain gage is not affected by ordinary changes in temperature, so that the gage is suitable for use in the direct sunlight. Its frame is constructed of stainless metal. The illustration shows gages 10 and 2 inches long, respectively. On the 10-inch gage, each mark on the dial represents 500 pounds per square inch, based on a modulus of elasticity of 30,000,000, while on the 2-inch gage, each graduation has a value of 1000 pounds per square inch.

Mauser Vernier Depth Gages

Two sizes of Mauser vernier depth gages having a measuring length of 3 and 6 inches, respectively, have been placed on the market by the George Scherr Co., 128 Lafayette St., New York City. Each of these tools consists of a base and a sliding bar that operates in a dovetailed groove in the base. The sliding bar is graduated in inches and to 0.025 inch, while the vernier on the base reads to 0.001 inch.

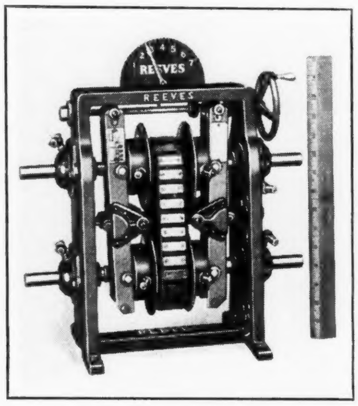
A hardened steel pin is inserted in the lower end of the sliding bar for use in taking measurements. The reading obtained at the vernier represents the distance from the end of this pin to the under side of the base. The pin is adjustable for wear.



Mauser Three- and Six-inch Vernier Depth Gages

Reeves Small-Sized Variable-Speed Transmission

A vertical type of variable-speed transmission with a capacity of from 1/8 to 3/4 horsepower is the latest development of the Reeves Pulley Co., Columbus, Ind. It is believed to be the smallest variable-speed transmission of vertical type ever built. The small size will be apparent from a comparison with the 15-inch ruler shown beside the unit in the accompanying illustration.



Vertical Variable-speed Transmission of Unusually Small Size

The speed range of this No. 0000 transmission is from 2 to 1 up to 6 to 1. The unit can be equipped with a motor base, an individual motor, an auxiliary countershaft for greater speed reduction, and the extended lever type of Reeves mechanical automatic control. The unit is also available in an enclosed design.

* * *

There are, at the present time, 40,000 car and truck dealers in the United States, 98,000 garages, service stations, and repair shops, and 70,000 supply stores.

Beryllium Copper—a New High-Strength Alloy

A new product, known as "beryllium copper," has been developed by the American Brass Co. This new alloy possesses unusual physical properties which can be greatly increased by heat-treatment. For instance, by heat-treating, the tensile strength of one specimen of hard-drawn beryllium-copper wire was increased from 108,000 pounds per square inch to 190,000 pounds per square inch.

The principal advantages of the alloy are its high tensile strength, high fatigue limit, and hardness. Its electrical and thermal conductivity are also relatively high, and its resistance to corrosion is comparable with that of copper.

The new alloy may contain from 1 to 2.25 per cent beryllium, with the balance copper. The commercial alloy contains 2.25 per cent beryllium. The new alloy is available in sheets, strips, rods, wire, and tubes, in the sizes and gages in which phosphor-bronze is ordinarily furnished. It can also be used for die-pressed forgings.

One of the outstanding advantages of the new alloy is its machineability, which compares favorably with that of other high-strength metals. While it cannot be classified as a free-cutting alloy, it is not difficult to machine. It can be brazed, silver-soldered, or soft-soldered almost as easily as pure copper. It may be welded in an induced atmosphere of hydrogen. In appearance, the alloy closely resembles pure gold.

Rubber Belting that Resists Chemicals and Oils

Rubber belting that is not readily affected by chemicals and oils is now being made by the B. F. Goodrich Co., Akron, Ohio, under patents recently issued. For years, experiments have been conducted to discover a process to protect rubber belting from the destructive action of acids, alkalies, and oils. The new belting has given satisfactory service after complete immersion in oil for several days. Ordinary rubber belting lasts only one-third as long when subjected to similar exposure. B. S. Taylor, manager of material development for the Goodrich processing division, is the inventor of the new belting.

* * *

It is possible to use the present period of reduced activity to study ways and means of improving production and maintenance methods. An example of how this can be done is furnished by the American Rolling Mill Co. at Middletown, Ohio, where a course in welding design was recently arranged for the designing engineers, electrical engineers, and maintenance men of the company. About thirty-five men attended the classes. The course was of three days' duration, dealing with the arc-welding process and the theory of redesign for welded steel construction. It was given under the direction of E. W. P. Smith, consulting engineer for the Lincoln Electric Co., Cleveland, Ohio.

British Machinery Exports to Russia

According to official British statistics, the value of machine tools exported from Great Britain to Soviet Russia during the first nine months of 1932 amounted to £2,021,914 (at present exchange rates approximately $6,600,000). This represents approximately 83 per cent of the total export trade in machine tools from Great Britain during the period referred to. These figures indicate the great importance of the Russian market to the machine tool industry. During the past year, British machine tool exports to Russia have greatly increased over previous years, while those of the United States have fallen off, due largely to the efforts made by the British Government to encourage trade with Russia.

* * *

The world's export trade for 1932 shows a decrease of slightly over 20 per cent from that of 1931, and nearly 32 per cent from the peak of international trade in 1929, according to the annual report on world trade issued by the National Foreign Trade Council. The total international world trade amounted to 21 billion dollars in 1931, as compared with about 16 billion dollars in 1932. The point of outstanding interest in connection with these figures is that the decrease in the foreign trade of the United States is not any greater than the average trade losses throughout the world.

Do You Know

that camshafts for a well-known automobile are now being made from castings instead of from forgings?—see page 309.

that gears and pulleys are being made on a commercial scale by welded construction in large quantities?—see page 325.

when and how dry ice is applied to shop operations and what advantages are gained by its use?—see page 305.

what properties are essential in a good lubricant for drawing operations in power presses?—see page 348.

what new applications have recently been made in the use of synthetic plastic materials, such as Bakelite and Durez?—see page 351.

what solution and precipitation heat-treatments are as applied to aluminum alloys, and what results are obtained by these treatments?—see page 319.

NEWS OF THE INDUSTRY

Alabama

Link-Belt Co., 910 S. Michigan Ave., Chicago, Ill., has appointed the Moore-Handley Hardware Co., 25 S. 20th St., Birmingham, Ala., distributor and direct representative for the entire Link-Belt line of elevating, conveying, and power transmitting machinery in the Birmingham territory.

Illinois and Indiana

Consolidated Machine Tool Corporation of America, Rochester, N. Y., has appointed the Dean Machinery Co., Inc., 80 E. Jackson Blvd., Chicago, Ill., exclusive selling agent for Betts, Newton, Colburn, and Hilles & Jones machines in the Chicago territory.

Morse Twist Drill & Machine Co., New Bedford, Mass., announces that it is now carrying a complete stock of high-speed and carbon drills, reamers, taps, dies, and milling cutters at 570 W. Randolph St., Chicago, Ill.

Detroit Seamless Steel Tubes Co., Detroit, Mich., announces the removal of its Chicago district sales office to 1768 First National Bank Bldg.

E. J. Hayden, central division manager of the Linde Air Products Co. at Chicago, Ill., was elected president of the International Acetylene Association at its recent annual meeting in Philadelphia. Mr. Hayden was formerly a vice-president of the Association. He has been connected with the sales and development phases of the oxy-acetylene welding and cutting industry for more than eighteen years, a period that marks practically the entire industrial growth and development of the oxy-acetylene process.

E. J. Hayden, New President of the International Acetylene Association

Roots-Connersville-Wilbraham, Connersville, Ind., manufacturers of blowers, pumps, and meters, report the largest volume of unfilled orders since last March. Orders booked during November exceeded the total for the same month in 1931; this is the second comparative monthly gain for the current fiscal year over last year.

New England

Bristol Co., Waterbury, Conn., has established a British factory at London, England, under the name of Bristol's Instrument Co., Ltd. Howard H. Bristol, president of the Bristol Co., is chairman of the board of directors of the new company, and Alexander L. Dugon of J. W. & C. J. Phillips, Ltd. (former sales agent of the company in England) is vice-chairman and managing director. The plant is located at 144 Pomeroy St., New Cross, London, and consists of an office building and a new two-story factory building of modern construction. A complete line of Bristol indicating, recording, and controlling instruments will be produced at the English factory.

Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill., announces the appointment of the General Machinery Corporation, 140 Federal St., Boston, Mass., as exclusive dealer in the Boston territory for Dreses radial drills, Ohio shapers and planers, Boye & Emmes engine lathes, Ohio horizontal boring, drilling, and milling machines, Cleereman drills, Kling heavy-duty grinders, and Imperial arc welders.

A. M. Snodgrass has been appointed production manager of the Pittsfield, Mass., Works of the General Electric Co., Schenectady, N. Y. Mr. Snodgrass has been in the employ of the company for the last twenty years, and since 1930 he has been production manager of the West Lynn, Mass., Works of the company.

Richard A. North has been appointed assistant chief engineer of the Farrel-Birmingham Co., Inc., Ansonia, Conn. Mr. North has had a diversified experience in various phases of mechanical engineering and management, acquired in several years of collegiate teaching and in connection with prominent firms in the manufacturing and transportation fields.

R. A. North, Assistant Chief Engineer, Farrel-Birmingham Co., Inc.

L. Heres De Wyk, Derby, Conn., who has been associated for the last ten years with the Birmingham Iron Foundry and the Farrel-Birmingham Co. as engineer in charge of drop-hammers, mechanical presses, and other sheet-metal working machinery, has terminated his connection with this company and is now engaged in completing the design of a new line of sheet-metal working machines which he hopes to market in the near future.

New York

J. Kaye Wood has been elected vice-president and chief engineer of the newly formed General Spring Corporation, 11 W. 42nd St., New York City. Mr. Wood will also resume at the same address his practice as consultant in mechanical and structural engineering. He will give special attention to problems in the design and manufacture of mechanical springs, non-resonant spring suspensions or supports, automatic machines and equipment, and also to the solution of mechanical problems by relatively inexpensive models, dynamically scaled down in size. Mr. Wood was for seven years chairman of the Special A.S.M.E. Research Committee on Mechanical Springs.

Gould's Pumps, Inc., Seneca Falls, N. Y., has acquired the Hydroil Corporation, Lebanon, Ind., manufacturer of oil-purifying apparatus. The Lebanon plant is being discontinued and the business and equipment transferred to the Seneca Falls plant of the Gould company. D. B. Clark, vice-president of the Hydroil Corporation, and W. P. Alexander, factory and field representative,

will join the Gould organization, which will continue to manufacture the Hydroil centrifugal purifying machines at Seneca Falls.

ADVANCE PRESSURE CASTINGS, INC., 34 N. 15th St., Brooklyn, N. Y., has appointed the following sales representatives: F. X. Morris, 448 Irvington Road, Drexel Park, Delaware County, Pa.; L. E. & L. Sales Engineers, 212 Humber Bldg., Highland Park, Mich.; W. R. McDonough & Co., National Bldg., Cleveland, Ohio; B. J. Steelman, 224 S. Michigan Ave., Chicago, Ill.; and A. G. Werner, 5522 S. 37th St., St. Louis, Mo.

STUYVESANT EVENING TRADE SCHOOL, 345 E. 15th St., New York City, is organizing classes in structural drafting. Applicants for registration are limited to those that are or have been engaged in the trade. Further information can be obtained directly from the school.

THE TENTH NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, which was held at the Grand Central Palace, New York City, December 5 to 10, was attended by 98,741 visitors. There were 300 exhibitors.

Ohio and Michigan

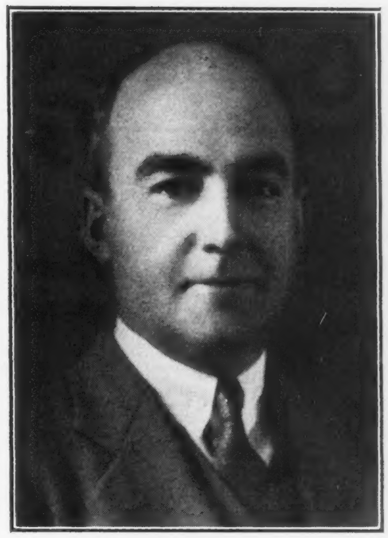
VAN NORMAN MACHINE TOOL CO., Springfield, Mass., announces that the sale of the Van Norman machine tool products, including duplex milling machines and oscillating and plunge-cut grinders, as well as special production equipment, is now being handled in the Detroit territory by the Charles A. Strelinger Co., 149 Larned St., E., Detroit, Mich.

R. H. GARRISON, former general sales manager of the Universal Motor Co., Oshkosh, Wis., has become associated with the Marble-Card Electric Co., Gladstone, Mich., manufacturer of electrical machinery, as vice-president in charge of merchandise. As an electrical engineer, Mr. Garrison's earlier training was with the General Electric organization, after which he managed a specialty jobbing business, distributed automobiles, and later joined the Universal Motor Co.

GEORGE C. MCMULLEN has joined the Tyson Roller Bearing Corporation, Massillon, Ohio, as manager of industrial sales. Mr. McMullen was connected for fifteen years with the Timken Roller Bearing Co., and prior to that was associated in manufacturing and engineering capacities with the Timken Detroit Axle Co. and the Crane Motor Car Co.

Pennsylvania and Maryland

RESEARCH & MFG. CORPORATION, 900 Victory Bldg., 10th and Chestnut Sts., Philadelphia, Pa., has been formed for the purpose of investigating and developing meritorious patents of individual inventors. Joseph S. Pecker will act as president and consulting engineer of the corporation, which will have an experienced engineering staff, as well as experimental shop facilities.



Thomas W. Pangborn, Newly Elected Vice-President of the National Founders Association

THOMAS W. PANGBORN, president of the Pangborn Corporation, Hagerstown, Md., was elected vice-president of the National Founders Association at its recent annual convention in New York. Mr. Pangborn was born in Brooklyn, N. Y., in 1880, and in 1904 founded the Pangborn Corporation, of which he has ever since been the head. Of late years, he has given much time to public activities and responsibilities. He is a director and past president of the Foundry Equipment Manufacturers Association and president of the Washington County Manufacturers Association. He is also a director in two Baltimore banks.

WALTER F. PERKINS, who has been manager of the Harrison, N. J., Works of the Worthington Pump & Machinery Corporation since 1927, has resigned to become vice-president and general manager of the Bartlett Hayward Co., Baltimore, Md. Mr. Perkins is succeeded as works manager at Harrison by Hugh Benet.

Coming Events

JANUARY 7-14—National Automobile Show at the Grand Central Palace, New York.

JANUARY 16 - FEBRUARY 15—Exhibition of New Materials, New Products, and New Uses at 65 E. 56th St., New York City, under the auspices of the National Alliance of Art and Industry, Inc. Wilford S. Conrow, secretary.

JANUARY 23-26—Annual meeting of the Society of Automotive Engineers at the Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary, 29 W. 39th St., New York City.

JANUARY 26—Meeting of the Gray Iron Institute at the Congress Hotel, Chicago, Ill. For further information, address Gray Iron Institute, Inc., 4300 Euclid Ave., Cleveland, Ohio.

JANUARY 28-FEBRUARY 4—National Automobile Show at Chicago, Ill.

FEBRUARY 19-20—Conference on Welding at the Case School of Applied Science, Cleveland, Ohio. For information, address Fred L. Plummer, Case School of Applied Science.

FEBRUARY 23-24—Second annual Welding Conference and Exhibition to be held in the Industrial Engineering Building, Ohio State University, Columbus, Ohio. Manufacturers of welding equipment and supplies are invited to exhibit. There is no charge for floor space. O. D. Rickly, Director of Engineering Shops, Ohio State University.

MARCH 8—Regional meeting of the American Society for Testing Materials in New York City. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

JUNE 19-23—Annual convention and exposition of the American Foundrymen's Association at the Hotel Stevens, Chicago, Ill. C. E. Hoyt, executive secretary-treasurer, 222 W. Adams St., Chicago, Ill.

JUNE 25-30—Sixth Midwest Engineering and Power Exposition in the Coliseum, Chicago. Exposition headquarters, 308 W. Washington St., Chicago, Ill.

JUNE 26-29—Semi-annual meeting of the American Society of Mechanical Engineers at the Hotel Stevens, Chicago, Ill. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

JUNE 26-30—Annual meeting of the American Society for Testing Materials at the Hotel Stevens, Chicago, Ill. C. L. Warwick, secretary-treasurer, 1315 Spruce St., Philadelphia, Pa.

Obituaries

Charles A. Schieren

Charles A. Schieren, president of Charles A. Schieren & Co., New York City, manufacturers of belting, died at his home in New York on December 4 at the age of sixty-three years. Mr. Schieren attended the Polytechnic Institute of Brooklyn, N. Y., and when he was seventeen years old, entered the leather business started by his father sixty-eight years ago. He became a partner in the business in 1898, and was elected treasurer of the company upon its reorganization in 1908. Upon the death of his father in 1915, he succeeded him as president of the company.

Mr. Schieren was long active in the Foreign Trade Council, and was a member of the Board of Governors of the Machinery Club of New York, in the organization of which he took part. Mr. Schieren never married; he is survived by a sister and two brothers, G. Arthur and H. V. Schieren.

George P. Baldwin, vice-president of the General Electric Co. in charge of activities connected with steam railroad electrification, died of pneumonia December 7 in the Doctors' Hospital, New York City, after an illness of only a few days.

Daniel S. Haviland, secretary of the Universal Boring Machine Co., died at his home in Hudson, Mass., on November 17, after a long illness. Mr. Haviland was fifty-four years old. He had been associated with the company since 1918.

New Books and Publications

Thomas' Register of American Manufacturers—1932-1933. 4500 pages, 9 by 12 inches. Published by the Thomas Publishing Co., 461 Eighth Ave., New York City. Price, $15.

This is the twenty-third edition of this well-known purchasing guide containing a list of all American manufacturers and primary sources of supply. The present volume follows the same arrangement as previous editions. The first section of the book (printed on yellow paper) contains an index or "finding" list, covering all the products included in the classified section. The second section (printed on white paper), which comprises the main part of the book, is the classified list of manufacturers arranged alphabetically according to product. This section of the book is completely cross-indexed and covers 3428 pages. There is an appendix to the main section containing a list of representative banks, boards of trade, chambers of commerce, and similar commercial organizations, as well as trade papers. The third section of the book (printed on blue paper) contains an alphabetical list of manufacturers. In many cases the branch offices are given as well as the home office. Following this section, is the "trade name" section (printed on pink paper), in which the trade names of the products listed are given in alphabetical order. This book has already proved its usefulness to sales managers and purchasing agents in many different fields for making up lists of prospects or of sources of supply.

Machine Tool Work. By William P. Turner. 424 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York City. Price, $3.

The material presented in this book is based on a course of instruction in machine tool work given at Purdue University. Brief outlines of the lectures, together with detailed instructions for solving the different problems, have been printed and made available for student use. This material has been completely revised and is now offered in book form. The purpose of the work is to present a systematic course of instruction in the fundamental principles of machine tool work. The scope of the book will best be understood by a list of the chapter headings, which are as follows: General Shop Instructions; Tool Shapes for Cutting Metal; Cutting Speeds and Feeds; Metals Commonly Used in Machine Tool Work; The Lathe and Lathe Work; Tapers and Taper Turning; Boring and Facing; Kinds of Fits and Fitting; Screws and Screw Threads; The Shaper and the Planer—Their Work; The Milling Machine and Its Uses; Gears and Gear Cutting; The Turret Lathe and Turret Lathe Work; Drilling Machines and Drilling; Keys and Keyways; The Grinding Machine and Grinding Methods; and Miscellaneous Problems in Machine Tool Work.

Engineering—A Career, A Culture. 61 pages, 6 by 9 inches. Published by the Engineering Foundation, 29 W. 39th St., New York City. Price, 15 cents.

This pamphlet is addressed to young men and to parents and teachers. It is descriptive of the profession of engineering, its field, and the training and qualities required for its successful pursuit. It also deals with the obligations that it imposes and the rewards that it affords. It shows the practical usefulness of engineering education in vocations other than engineering, and points out the cultural values that an engineering education possesses.

Symposium on Steel Castings. 254 pages, 6 by 9 inches. Published jointly by the American Society for Testing Materials, 1315 Spruce St., Philadelphia, Pa., and the American Foundrymen's Association, 222 W. Adams St., Chicago, Ill. Price, $1.

This pamphlet contains reprints of ten technical papers in a symposium presented on steel castings sponsored jointly by the American Foundrymen's Association and the American Society for Testing Materials. These papers cover production, design, purchase requirements, physical and mechanical properties, alloy steels for castings, heat-treatment and welding.

Determination of Stress Concentration in Screw Threads by the Photo-Elastic Method. By Stanley G. Hall. 20 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin No. 245 of the Engineering Experiment Station. Price, 10 cents.

Column Curves and Stress-Strain Diagrams. By William R. Osgood. 11 pages, 6 by 9 inches. Published by the United States Department of Commmerce, Washington, D. C., as Research Paper No. 492 of the Bureau of Standards. Price, 5 cents.

Handbook of Industrial Temperature and Humidity Measurement and Control. By M. F. Behar. 320 pages, 6 by 9¼ inches; 278 illustrations. Published by Instruments Publishing Co., Pittsburgh, Pa. Price, $4.

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"Daylight" Control of Industrial Lighting Pays

At the Chisholm Ryder Plant, Niagara Falls, N. Y., a Westinghouse photo-electric control of the factory lighting saves 4000 kilowatt-hours monthly, reduces lamp replacements one-fourth, improves production, and reduces accidents. By having a photo-tube gage the intensity of daylight, the lights in the plant are automatically turned on during cloudy weather and extinguished when daylight returns to normal intensity.

Approximately fifteen foot-candles of light is maintained at the benches of toolmakers and at machine tools, the lighting of the entire plant being governed by changes in this standard of illumination. When the natural illumination drops to fourteen foot-candles, due to morning or evening darkness, the lights are turned on automatically and stay on until the daylight has raised the foot-candles to twenty. With photo-electric control, the lights burn only when needed, thus greatly increasing their life and saving current.

Classified Contents of this Number